

Audio

MAY 1986 • \$2.00

THE KEYS
TO CAR STEREO

12th ANNUAL
CAR STEREO
DIRECTORY
CLEAN FM SOUND AT
LONG DISTANCE



REVIEWS

H/K CH160 CAR STEREO
SHERWOOD CRD-180
CAR STEREO
HANDS-ON: YAMAHA
CAR EQUALIZER

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Matthew Polk's Revolutionary TRUE STEREO SDAs



SDA 2
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SDA CRS
\$395.00 ea.

SDA 1A
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Polk's revolutionary TRUE STEREO SDA Loudspeakers fully realize the astonishingly lifelike three-dimensional imaging capabilities of stereophonic reproduction.

"The Genius of Matthew Polk Brings You the Breathtaking Sound of the SDAs"

"Breathtaking...a new world of hi fi listening"

Stereo Buyers Guide

"Literally a new dimension in sound"

Stereo Review Magazine

"Mindboggling...Astounding...Flabbergasting"

High Fidelity Magazine

The experts agree: Polk's revolutionary TRUE STEREO SDAs* sound dramatically better than conventional loudspeakers!

"They truly represent a breakthrough"

Rolling Stone Magazine

Matthew Polk's critically acclaimed, Audio Video Grand Prix Award winning SDA technology is the most important fundamental advance in loudspeaker technology since stereo itself. Listeners are amazed when they hear the huge, lifelike, three-dimensional sonic image produced by Polk's SDA speakers. The nation's top audio experts agree that Polk SDA loudspeakers always sound better than conventional loudspeakers. Stereo Review said, "Spectacular...the result is always better than would be achieved by conventional speakers." High Fidelity said, "Mindboggling...Astounding...Flabbergasting...We have yet to hear any stereo program that doesn't benefit." Now the dramatic audible benefits of Polk's exclusive TRUE STEREO SDA technology are available in 4 uniquely superb loudspeaker systems, the SDA-1A, SDA-2, SDA CRS and the incredible new SDA SRS.

"Spectacular...Impressive Achievement"

Stereo Review Magazine

The design principles embodied in the SDAs make them the world's first true stereo speakers. When the big switch was made from mono to stereo, the basic concept of speaker design was never modified to take into account the fundamental difference between a mono and stereo signal.

What is the difference between a mono and stereo speaker? It's quite simple: the fundamental and basic concept of mono is that you have one signal (and speaker) meant to be heard by both ears at once. However, the fundamental and basic concept of stereo is that a much more lifelike three-dimensional sound is achieved by having 2 different signals, each played back through a separate speaker and each meant to be heard by only one ear apiece (L or R). So quite simply, conventional mono loudspeakers are designed to be heard by two ears at once while true stereo loudspeakers should each be heard by only one ear apiece (like headphones). The revolutionary Polk SDAs are the only TRUE STEREO speakers engineered to accomplish this and fully realize the astonishingly lifelike three-dimensional imaging capabilities of the stereophonic sound medium.

"An amazing experience."

High Fidelity Magazine

Words alone cannot fully describe how much more lifelike TRUE STEREO reproduction is. Reviewers, critical listeners and novices alike are usually overwhelmed by the magnitude of the sonic improvement achieved by Polk's Stereo/Dimensional Technology. You will hear a huge sound stage which extends not only beyond the speakers, but beyond the walls of your listening room itself. The lifelike ambience revealed by the SDAs makes it sound as though you have been transported to the acoustic environment of the original sonic event. Every instrument, vocalist and sound becomes tangible, distinct, alive and firmly placed in its own natural spatial position.

You will hear instruments, ambience and subtle musical nuances (normally masked by conventional mono speakers), revealed for your enjoyment by the SDAs. This benefit is accurately described by Julian Hirsch in Stereo Review, "...the sense of discovery experienced when playing an old favorite stereo record and hearing, quite literally, a new dimension in the sound is a most attractive bonus..." Records, CD's, tapes, video and FM all benefit equally as dramatically. SDAs allow you to experience the spine tingling excitement, majesty and pleasure of live music in your own home.

"You owe it to yourself to audition them"

High Fidelity Magazine

You must hear the remarkable sonic benefits of SDA technology for yourself. You too will agree with Stereo Review's dramatic conclusion: "the result is always better than would be achieved by conventional speakers...it does indeed add a new dimension to reproduced sound."

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*U.S. Patent Nos. 4,489,432 and 4,497,064. Other patents pending

Where to buy Polk Speakers? For your nearest dealer, see page 146

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Audio

MAY 1986

VOL. 70, NO. 5



See page 95

FEATURES

MUSIC ON THE MOVE:		
THE KEYS TO CAR STEREO	Ivan Berger and Hans Fantel	52
FMX: LONG DISTANCE STEREO,		
CLEAN AS MONO	Leonard Feldman	60

EQUIPMENT PROFILES

HARMAN/KARDON CH160		
CAR STEREO	L. Feldman and I. Berger	66
SHERWOOD CRD-180 CAR STEREO	L. Feldman and I. Berger	72
AURICLE: YAMAHA YGE-600		
CAR-STEREO EQUALIZER	Ivan Berger	81

CAR STEREO DIRECTORY

AMPLIFIERS/EQUALIZERS	95
CD PLAYERS	106
RADIOS/TAPE PLAYERS	107
SPEAKERS	115
COMPANY ADDRESSES	136

MUSIC REVIEWS

COMPACT DISCS	82	
ROCK/POP RECORDINGS	Michael Tearson, Jon & Sally Tiven	88
CLASSICAL RECORDINGS	Edward Tatnall Canby	92

DEPARTMENTS

SIGNALS & NOISE/ERRATA	6	
AUDIOCLINIC	Joseph Giovanelli	15
TAPE GUIDE	Herman Burstein	20
AUDIO ETC	Edward Tatnall Canby	26
ROADSIGNS	Ivan Berger	32
DIGITAL DOMAIN	Ken Pohlmann	36
BEHIND THE SCENES	Bert Whyte	42
SPECTRUM	Ivan Berger	48

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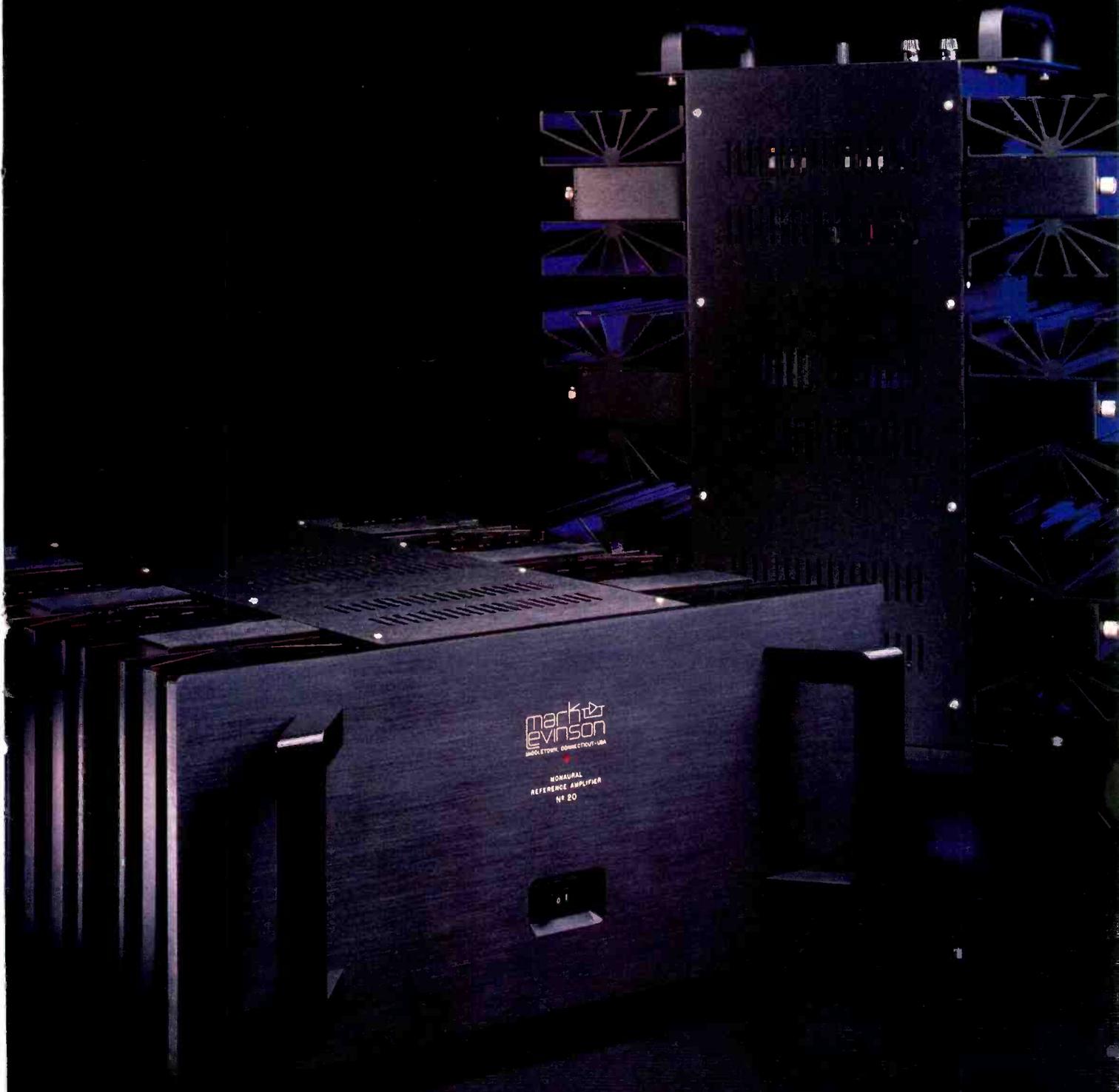
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See page 52

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Moderated Modifications

Dear Editor:

Walter Jung has written me about my references to my Dahlquist DQ-10s as having "Jung/Randall" modifications. The reference to Mr. Jung (in a review of the Bryston 4B amplifier in the November 1985 issue) was meant purely to signify that I had replaced the DQ-10s' original capacitors with polypropylene capacitors. I wanted to give Mr. Jung credit for his innovative ideas about the sonic properties of capacitors in the signal path, which have had a strong influence on the audio industry. The loudspeaker was greatly improved by these superior capacitors, with vastly improved depth of imaging, better speed and much less listener fatigue. I should have checked with him first to find out how he wanted to be credited, if at all.

By the way, the same pair of DQ-10s was also modified by Randy McCarter of Randall Research in Irvine, Cal., who replaced the piezoelectric tweeters with ribbon tweeters. He does have DQ-10 modification kits, some of which include replacement capacitors.

I would also like to notify readers that my modified Dahlquists are not a commercial product and are not under warranty by Dahlquist, but are solely the result of aftermarket tinkering.

Laurence L. Greenhill
Mamaroneck, N.Y.

Letters, We Get Letters

Dear Editor:

I returned from vacation to find a very informative and lengthy letter from your Contributing Editor Herman Burstein, responding to my long and rather rambling one. It was most kind of him to take time to give me such detailed and informative answers. As a result, I believe that I understand my situation much more completely.

Frankly, when I wrote to Mr. Burstein, I thought that he might just make a few notes on my letter and return it to me. His lengthy response was a real surprise and a most pleasant one. He has, perhaps, 20 questions which he personally answers for every one that appears in his "Tape Guide" column, and I really felt rather guilty that I added such a long inquiry to his already busy schedule. It is certainly a credit to him and to *Audio* that he can give such

personal attention to poorly informed readers such as myself.

As a result of all this, my respect for *Audio* increased substantially. I am going to subscribe, whereas in the past I have only purchased copies from the newsstand when the contents appeared to be interesting.

I would also like to personally show my appreciation in a more tangible way. If Mr. Burstein would like some Florida citrus or a bottle of wine, I would very much like to send it to him.

Boyd H. Anderson, Jr.
Fort Lauderdale, Fla.

Editor's Note: Mr. Burstein was very pleased to receive Mr. Anderson's letter. However, professional ethics prevent him from accepting the kind offer of fruit or wine.—A.P.

Shades of Gray

Dear Editor:

I enjoyed the timely article, "Gray Market: Is It Worth the Price?" in last September's *Audio*. True, many dealers who offer excellent service and advice are harmed by gray-market customers who solicit help and then buy elsewhere, but the gray market did arise from a need. Years ago, many dealers offered neither price breaks nor service and were arrogant to boot. The gray market still weeds those dealers out. The true audio salon will survive, even with the gray market, because there are enough of us who do want the service and the equipment in hand to support the local salons. We don't want mail-order surprises or ignorant salespeople.

James F. Fitzwilliam
Durham, N.C.

Déjà Review

Dear Editor:

I fear that the review in the October 1985 issue by Edward Tatnall Canby of Wendy Carlos' *Digital Moonscapes* irritated me nearly as much as the record irritated him. In the first place, it is my impression that Carlos did not merely pick up the latest digital technology and use it for her own purposes. Rather, she engaged in a major creative effort to transform waveforms and digits into "the new subtlety and expressiveness of these synthesized sounds." If this is true, Canby's casual

praise of this pioneering work is faint indeed.

But I am more concerned with Canby's evaluation of Carlos as "an updated Ferde Grofé." Although they may share some stylistic sources, I think their intentions are far different. Grofé seemed to achieve and exploit a complacent banality, while Carlos continues to surprise me with her exploration of musical styles. Among these styles are surely some, including [those of] Bach and Schoenberg, that would seem to have been of little interest to Grofé. Carlos may or may not discover a purely personal style, but I am enjoying her exploration.

Will the music of either composer survive? I cannot say. This morning, however, I heard Grofé's "Mississippi Suite" on the radio. It is as banal as ever, but not yet dead and buried.

LeRoy E. Doggett
Bethesda, Md.

Author's Reply: I also had a letter direct from Wendy Carlos and can both understand its strong feelings and go along with some of its points. My language and comparisons misfired, and said something other than what I had intended.

I underestimated Ferde Grofé's lowered status today, some 40 years after I first heard him. Grofé was once much admired, both technically on the professional level and by the amateur too. Thereby I brought Carlos down in my comparison and did not mean to.

I also used some ambiguous words, notably that dangerous "fluent"—which can mean good things but also suggests superficiality and even laziness. That could never apply to the painstaking work that Carlos does in the electronic medium!

Ever since *Switched On Bach*, in 1968, I have felt that Carlos was one of our very first "natural geniuses" in the new electronic medium, born to it, so to speak, as Paganini was for the violin. Other operators in comparison often seem clumsy and forced, or pretentious, as the case may be, even though their music may be valuable enough. That talent was just as clear in *Switched On* as it is today with more sophisticated equipment. As Carlos says, somebody has to show what can be done. The young R. Strauss—even

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With four times the magnetic storage capability of other high-bias cassettes, HX-S is better able to capture all the dynamics and purity of digital performance on any cassette deck with a high-bias switch.

Additionally, HX-S is unmatched in retention of high frequency MOL (Maximum Output Level). That means your Rock won't turn to rubble and Swan Lake won't swan dive.

And to maintain this digitally dynamic performance, TDK HX-S is housed in our specially engineered, trouble-free Laboratory Standard mechanism for unerring reliability and durability, backed by a Lifetime Warranty.

Get optimum results reproducing compact disc sound with TDK HX-S, the ideal cassette for digital recordings. You'll feel more at home with it whenever you step out.



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Artistic continuity from one generation to another depends on borrowing from older masters. Yet some do it better than others.

the young, experimenting J. S. Bach—could have said the same.

Musical value and, especially, musical "borrowing" are different matters, and very difficult areas. Nobody ever decides how far one can go in borrowing from older masters; after all, artistic continuity from generation to genera-

tion depends on it—and always has. And yet some do it better than others. I must stand on what my ears told me at the time I was writing my review. I could be dimly wrong, but there will be no final decision. And Carlos obviously has a lot more to say—like Beethoven did?—*Edward Tatnall Canby*

Loyal Lirpist

Dear Editor:

I'm glad to see Lirpa Labs was included in your October Annual Equipment Directory. I hadn't heard anything regarding this distinguished gadgeteria in a while and just wanted to let you know there are still hard-core Lirpa enthusiasts here in Syracuse. By the way, is it true that Lirpa Labs is currently manufacturing remote controls for their remote controls?

L. Jeffrey Lovell
Syracuse, N.Y.

Editor's Note: It's a remote possibility.—*I.B.*

Rabbit Test

Dear Editor:

Although I am pleased with my CD player, a Technics SL-P1, my pet rabbit is not. Whereas he used to stretch out in front of the speakers and listen to vinyl-and-needle with his eyes closed and teeth grinding (rabbit heaven, apparently), he flees from CD music. It appears that some rodent-offensive frequencies, inaudible to us human beings, are sneaking through! Latter-day Pied Piper?

Nigel Moll
New York, N.Y.

Errata

This past winter does not seem to have been our season for photo captions and credits. To wit:

- In our January feature on the Museum of Broadcasting, we misidentified one of three people in the upper photo on pages 60-61. The central figure in the picture, taken during a 1951 radio broadcast, is not director Don Hewitt but commercial coordinator Henry Hanson. At left and right—as we had stated—are producer Fred W. Friendly and journalist Edward R. Murrow.

- In our February interview with producer Bob Thiele, we misidentified one of the three people in the photo on page 38. The three (left to right) are Louis Armstrong, Bob Thiele, and Duke Ellington.

- Also in the Bob Thiele interview, due to a printing error, credit for the opening-spread photo of Mr. Thiele (pages 36-37) was omitted. The photo was taken by Robert Lewis.

We apologize for any confusion that may have been created.—*E.P.*

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JOHN WILLIAMS

THE BOSTON POPS



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compact disc
one step further...**



DiscJockey
**The world's first
car compact disc changer.**

**From the people
who started the
compact disc
revolution.**

The compact disc is recognized the world over as the premium playback medium for unsurpassed music reproduction. As the inventor of compact disc, Sony has been widely acknowledged as the world leader in digital audio technology, and the CD revolution.

It was Sony who excited audiophiles around the globe with introduction of the first home and portable compact disc players. And in 1984, Sony shook the world again with the introduction of the world's first car compact disc players, the CDX-R7 and CDX-5.

Now, while other manufacturers are finally introducing their own brand of car compact disc products, Sony drives the digital audio revolution one step further by introducing the world's first car CD changer. The **Sony DiscJockey**.

To meet the extraordinary design challenges posed by the mobile environment, Sony called upon its vast experience in industrial, as well as home, portable and car compact disc products. Given the scope and complexity of this undertaking, it's easy to see why Sony was the first to introduce a fully-integrated car compact disc changer that provides up to 10 hours or more of continuous listening enjoyment.



SONY

DiscJockey™

The first fully-integrated car compact disc changer system.

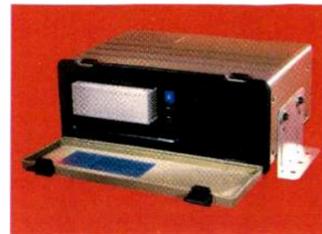
The total system approach to car compact disc enjoyment.

In approaching the design of a fully-integrated car compact disc system, Sony's engineers had to meet four basic performance objectives: convenience, reliability, flexibility and security. Sony met all of these requirements with the creation of *DiscJockey* CDX-A10, the world's first car compact disc changer.

At the heart of the CDX-A10 is Sony's unique trunk-mounted 10-disc changer mechanism, engineered to provide up to 10 hours or more of continuous compact disc listening. A palm-sized

Remote Commander™, connected to the changer can be mounted in the dash or left unmounted for more flexible operation. The multi-function commander provides complete remote operation of the system's changer mechanism and preamplifier controls, as well as an optional quartz synthesis tuner pack.

The CDX-A10 can be configured as a dedicated CD changer and AM/FM stereo system, with the addition of an optional stereo amplifier, speakers and XT-10 tuner pack. Or, the *DiscJockey* can be used in conjunction with your existing tuner/cassette front end unit. A closer look at the CDX-A10 will show you why it's the most exciting and revolutionary compact disc system on the road today.



The ingenious DiscJockey changer mechanism.

To survive the harsh realities of the road, Sony's unique CDX-A10 disc changer mechanism and road-proven compact laser optic assembly are housed in a sturdy enclosure made of high-impact material. This outer casing is dust and moisture resistant, making it ideal for airplane and boat applications as well as automotive use. The unit is also specifically designed for easy

installation in a vehicle's trunk or rear compartment. With the CDX-A10's changer installed out of sight, the *DiscJockey* offers an added measure of security and protection.

Disc changing operation is accomplished through the use of a special 10-disc magazine. To insure precise tracking, even while subjected to the punishing effects of uncharted potholes and mechanical vibration, the laser optic assembly, magazine and changer mechanism are securely nestled in a free-floating sub-suspension.

For added reliability and stability, even under the most adverse weather conditions, all critical digital functions are controlled and monitored by a proprietary VLSI (Very Large Scale Integrated Circuit) micro-processor chip. Additional micro-processor circuits also relay error messages to the remote commander's display panel, so you can quickly confirm the entire system's current operating status.

For easy program selection, each magazine comes with a CD liner note folder that enables you to create a handy reference of all discs stored. Additional

XA-10 magazines can also be purchased so you can create different music compilations. And for the utmost in flexibility, these magazines will also be compatible with future Sony home compact disc changers.



The DiscJockey Remote Commander.®

Designed to be easily connected by cable to the system's changer mechanism, the CDX-A10's new DIN-sized control commander can be permanently installed in the dash of most foreign and domestic cars, or it can be mounted on an optional control pod. (A security cover is also provided to conceal the commander for in-dash use.) For increased operating convenience, the commander can be left unmounted for handheld operation by all passengers, and then stored out of sight under the front seat for added security.

The commander features a softly illuminated, multi-function LCD display, with all CD, tuner, and preamp mode operations visible at a glance. Each control is feather-touch operated and is designed, according to size and placement, to provide optimum operating convenience. Also, to assure proper selection of desired control or program functions, all control commands are easily confirmed by both the LCD display and an audible "beep" from the control unit.

For the utmost in preamplifier flexibility, the CDX-A10's remote commander features a complete complement of signal processing options. Volume, bass, treble, balance and fader controls are logically grouped together for easy access. A three-position Dynamic Range Suppressor (DRS) lets you compress the music's dynamic range "window" to help compensate for variations in ambient noise conditions. A defeatable Surround Sound circuit also provides greatly enhanced stereo imaging from rear channel speakers.

DiscJockey programming options.

No other compact disc system on the road today offers the programming options and extended playback capabilities of the *Sony DiscJockey*. You can play back up to 10 discs automatically and sequentially, beginning with program one of the first disc. The CDX-A10 also allows you to access any selection on any disc by simply entering the disc and track number, or by using the Automatic Music Sensor™ (AMS) to skip from song to song in either direction. And, with the high-speed Music Search feature, you can also "sample" the music at ten times the standard playing speed, while listening at normal pitch.

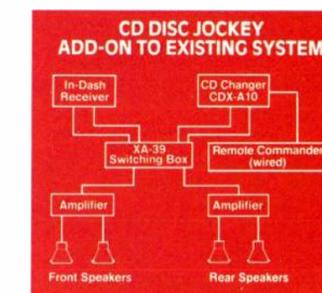


For added convenience, a Random Music Sensor (RMS) allows you to choose up to five selections for repeat or random playback from any discs stored in the magazine. And the "Program Play" feature also enables you to program into permanent memory an additional ten selections from any of the ten discs. Once programmed, these selections remain in memory and can be recalled at any time—even if you change listening sources during operation or turn off the vehicle's ignition.

Optional Quartz Synthesis AM/FM Tuner Pack.

With the addition of Sony's optional XT-10 Quartz Synthesis Tuner Pack, you can enjoy the finest in AM and FM stereo reception. The tuner pack mounts under the changer mechanism, with all tuning functions completely integrated and accessible from the Remote Commander. AM/FM tuning mode and station frequency are also shown on the Remote Commander's LCD display.

In addition to offering quartz tuning accuracy and drift-free reception, the XT-10 provides 20 station presets (10 FM, 10 AM), automatic scan tuning, manual tuning, an FM stereo/mono switch, a local/distance switch and Impulse Noise Suppression (INS) circuitry.



DiscJockey System Flexibility.

The CDX-A10 is designed to be used as a completely integrated CD and AM/FM stereo system (with the addition of optional stereo amplification and speakers). It can also be used in conjunction with an existing tuner/cassette system (optional XA-39 switching control box required). With preamp outputs for up to two stereo power amplifiers (or one four channel amp), the *DiscJockey* has been thoughtfully designed for the utmost in system flexibility. A graphics subcode port has even been included for future applications.

FEATURES and SPECIFICATIONS

- 10 Disc Playback Capability
- Direct Disc and Track Selection
- Automatic Music Sensor™ (AMS)
- Random Music Sensor (RMS)
- Program Play
- High Speed Music Search

Specifications

System Format: Compact Disc Digital Audio System

Signal Readout: Non-contact semi-conductor laser (wavelength 780nm)

Laser diode material: GaAlAs

Sample Frequency: 44.1 kHz

Quantization: 16 bit linear

Error Correction: Sony Super Strategy (CIRC)

Disc Playback Time: Up to 74 minutes

Compact Disc Channels:

Two Frequency Response: 5-20,000 Hz

Harmonic Distortion: LESS than 0.015% (at 1 kHz)

Dynamic Range: More than 85 dB (DRS I: 76 dB DRS II: 65 dB)

Signal-To-Noise Ratio: More than 90 dB

Stereo Separation: More than 78 dB

Wow and Flutter: Below measurable limits

XT-10 FM/AM Tuner (Optional)

FM Usable Sensitivity: 9.3 dBf

Signal-To-Noise Ratio: 70 dB (mono); 67 dB (stereo)

Capture Ratio: 1.5 dB

Harmonic Distortion: 0.15% (mono); 0.3% (stereo) at 1 kHz

Separation: 42 dB (at 1 kHz)

Alternate Channel Selectivity: 75 dB (± 400 kHz)

General

Line Output: 1200 mV impedance (± 10k ohms, RCA (– 10 dB disc, maximum level))

Power Requirements: 12 volt DC

Current Drain: 800mA (play mode)

Dimensions: (WHD)

12 3/4 x 5 1/4 x 8 3/4 in. (Changer)

321 x 131 x 220 mm

7 x 1 1/16 x 7/8 in. (Remote Commander)

178 x 48 x 25 mm

Weight: 12 lbs. 6 oz. (5.6 kg)



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SONY CORPORATION OF AMERICA, National Operations Headquarters, Sony Drive, Park Ridge, NJ 07656

Intermittent Auto Amplifier

Q. My car amplifier does not operate properly. Sometimes I can turn it on and it is just fine. Other times it works for a few seconds, then turns itself off. At other times it does not turn on at all. I have checked the voltage to the amplifier and to the switch wiring; it looked good. I also checked the speaker wiring for shorts and failed to find any.

The amplifier I am now using is the third one I have tried. The same condition occurred with the others. What do you think could be my problem?—Martin Haase, Ellendale, N.D.

A. The fact that you've tried three amplifiers indicates that the problem lies in something other than the particular amplifier you are using.

You said you checked the voltage. Were those checks made while the amplifier was turned on and when the amplifier appeared to turn off? Did you make your checks against the ground point on the amplifier? Even though the voltage is normal when no current is drawn, it may drop when the unit is turned on; current demands may produce problems because of loose connections or defective switch contacts.

It is usually best to wire amplifiers directly to the battery and not to existing wiring (such as the cigarette-lighter connection). Appropriate fusing should be placed in the amplifier line.

There's one more check to make, which applies only if your car-stereo head unit has speaker-level outputs as well as (or instead of) preamp-level ones: Disconnect the speaker cables from the amplifier and connect them to the head unit instead. (I hope the routing of these cables allows this.) Operate the system in this way for a few days. If you find that the intermittent problem still occurs, the defect is not with the amplifier, but is due either to poor speaker connections or a defect in the head unit.

(Editor's Note: We also checked with a car-stereo specialist, Tony Igel, of Stratford Service in New York. He stresses the importance of checking ground connections, as intermittent grounds are a frequent cause of problems in car-stereo operation. He also suggests that the amplifier may have a thermal shut-off circuit, which could shut the amplifier off and then reset.

Such circuits can be triggered by amplifier overheating due to load problems, such as intermittent defects in the speakers or speaker wiring. They can also be triggered by external heat sources such as the engine, if the amplifier is mounted on the firewall. The same can happen when a car is parked in the hot sun, but we suspect this is not a problem, most of the year, in North Dakota.

We also checked with your amplifier's manufacturer, who says that your problem could be caused by a very low load impedance—presumably less than 2 ohms—or by intermittent shorts in the speaker connections.—*J.B.*)

Safe Timer Connections

Q. There are two a.c. outlets on my timer. I have an integrated amplifier plugged into one outlet and an equalizer plugged into the other. Connected to my integrated amplifier are a turntable, noise-reduction unit, and FM tuner. The instructions for my timer say it can supply 700 watts maximum. I have added up the wattages of the equipment plugged into the timer and arrive at 359 watts total power. I know this is much less power than the timer's instructions tell me is safe, but with all of this equipment being turned on/off at one time, and all funnelled down into a single power cord (from the timer), is this arrangement really safe?—Teddy Herbst, Swiftwater, Pa.

A. Yes, there is no problem with your wiring. The factor which limits the power that can be supplied by a timer is related to the switch contacts and what they can withstand by way of arcing. Believe it or not, the power cord can be readily "sized" to handle the 700 watts or more.

Even though the loads we are discussing are inductive, and though back voltage will cause arcing across switch contacts at times, designers are well aware that their timers will be used with such loads. As a consequence, added safety factors are usually included.

Feeding Turned-Off Equipment

Q. I frequently listen to my Compact Discs with headphones via my CD player's headphone jack. I am concerned about the 2-V output from the player feeding the AUX input of my

preamplifier, which is turned off. Will any harm be caused by this?

Similarly, when listening to LPs through my preamplifier's headphone jack, I keep the power amplifier turned off to prevent sound from reaching the speakers. Will any harm be caused by the preamplifier feeding its signal into a "dead" power amplifier?—Russell S. Low, San Francisco, Cal.

A. Your preamplifier will not be damaged by signal feeding into its AUX input when the power is turned off. The same is true of your amp.

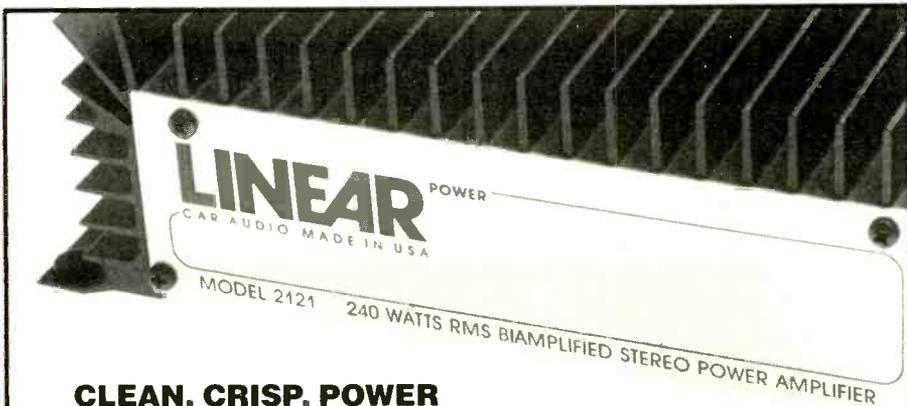
Along slightly different lines, you should be careful about the setting of your program-selector switch when using your player as you have described. It was my sad experience to have had a preamplifier set to its phono position with a CD player connected and turned on. Like many preamplifiers, inputs which are not in use are shorted in order to prevent unwanted signal leakage. This player was a direct-coupled type, and the shorted input caused serious overheating of the player's output IC. I was within seconds of wrecking its output stage. (And it was a borrowed machine!!)

Distant Mike Pickup

Q. I'm interested in putting together a portable sound system—consisting of a microphone, a recorder, and an amplifier—to pick up the sound of voices at a greater-than-normal distance from the mike (20 to 100 feet). I have received conflicting advice from various dealers. One said I should use a PZM mike in conjunction with a small parabolic dish. Another said I would need a shotgun mike. Do I need an amplifier? If so, what type? Would a 20-watt guitar amp be good? Must I match the mike to the amp?—Lawrence Charles, Westbury, N.Y.

A. I believe a shotgun mike is the simplest, and possibly the best, solution to the problem. Boundary microphones such as the PZM might also work, though I have not heard of the PZM being used in conjunction with a dish. At the near end of your distance

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.



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The MODEL 2121 is the first car audio product to use a PHASE COHERENT ELECTRONIC CROSSOVER making it the most flexible and sophisticated bi-amplification, expandable to a tri-amp system.

Linear Power engineers developed a Phase and Amplitude Compliment Circuit, (PAC) that looks at and compares output signal to input and adds the inverse to make them identical which eliminates phase distortion. The MODEL 2121 contains a 60 watt RMS per channel stereo amplifier to power the main speaker system and, a 120 watt RMS mono subwoofer amplifier with a PHASE COHERENT CROSSOVER that is infinitely adjustable between 45Hz and 200Hz.

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Recording voice at some distance from the mike is always difficult. There is a better chance of success taping outdoors.

range, a cardioid, hypercardioid or even a figure-eight microphone might do the job. The unidirectional (cardioid and hypercardioid) types are preferred where interfering noises and room echoes are most likely to come from behind the microphone, while the bidirectional (figure-eight) type is better where the interference would come from the sides.

If your purpose is recording, you do not need a power amplifier. An amplifier would be needed only if you were going to drive loudspeakers. If your recorder's microphone input does not have sufficient gain, you might need an external microphone preamp between the microphone and recorder. This could be either the preamp in a microphone mixer (if you have a good, quiet one) or a musical-instrument "power booster." Shure, I believe, makes a fixed-gain phono preamp (for professional use) whose RIAA equalization can be switched out for "flat" response; this, too, might suit your purpose if you need more input gain. In any case, make sure the microphone's impedance is close to (and no higher than) that of the input it feeds. It may be necessary to use a high-quality impedance-matching transformer to make the two work well together.

If the microphone input is sensitive enough, however, do not use a booster. In fact, its use may degrade the signal by adding more noise than is present in the recorder's mike input.

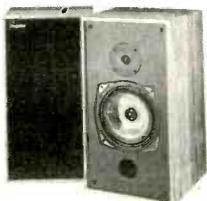
Recording voices which are some distance from the microphone is fraught with other problems. If the recordings are to be made indoors, reflections from walls, floor and ceiling may render the voices unintelligible, even with highly directional microphones. If the recordings are made outdoors, you stand a better chance of extracting information from them, unless there is a lot of background noise coming from the direction towards which you have the mike pointed.

I trust your reason for recording from a distance is not to record concerts or other performances without the permission of those being recorded. This could lead to legal complications. In any case, the equipment required to make good recordings under such circumstances would be too bulky to be used surreptitiously. 

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- "The LS 3/5A is a real monitor speaker, the sound is just amazing. The stereo image is just wonderful." *New HiFi Sound, 1985 (UK)*
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Bryston has never considered price to be an important criterion in the design of a product, only the best possible audible performance. The cost was simply a result of the components required to accomplish that end.

Bryston reasoned there is a large number of audiophiles, no less demanding in their expectation of component (and sonic) quality, who have decided to remain

with a basic, though highly competent, sound system using only a few of the finest signal sources. For you, if you are among this uncompromising group, there is now the Point-Five-B.

The .5B utilizes the finest components including a laser-trimmed volume control, hand tested and selected transistors in all amplification functions, metal film resistors and polystyrene capacitors matched to less than 1%. The preamplifier undergoes extremely close inspection and a

100-hour burn-in prior to shipping.

The .5B is a "final purchase" preamplifier, (i.e. its performance may be favourably compared even to the most costly "exotics", and it is unlikely to be surpassed in the near future), but is meant to be used in a sound system employing only a few quality components.

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THE SILENT TREATMENT.

WHY BOB CARVER'S MINIATURE RADIO STATION LEFT THE AUDIO PRESS SPEECHLESS AND HOW IT LED TO THE MOST COMPLETE STEREO TUNER EVER OFFERED.

The new Carver TX-11a Stereo AM-FM Tuner is a technical tour-de-force which further distances Bob Carver's unique products from traditional electronic components — and which can vastly enhance your musical enjoyment.

TWO TECHNOLOGICAL INNOVATIONS.

The performance of the legendary TX-11 Asymmetrical Charge Coupled FM Stereo Detector Tuner is increased by the addition of Ultra High Frequency Wide Band AM Stereo circuitry. With the new TX-11a, AM stereo sounds as good as FM.

Yes, contrary to popular belief, most AM stereo stations have frequency response (20Hz-15kHz), separation (35dB) and signal-to-noise ratios (70dB) audibly indistinguishable from FM stations of equal strength. It's just that **only** Carver offers the technology to appreciate this hidden performance.

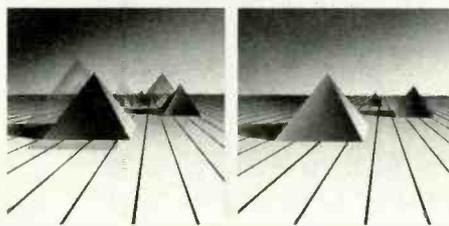
As for FM stereo, the TX-11a virtually eliminates multipath and distant station noise while providing fully-separated stereo reception with space, depth and ambience!

Bob Carver's Asymmetrical Charge Coupled FM Stereo Detector removes (without affecting stereo imaging, frequency response or dynamic range) the hiss, clicks, pops, "picket fencing" and the myriad other unpredictable noises which all too often disturb FM listening.

(Still interested in the story of the miniature radio station and how it impressed hard-to-impress audio critics? Read on. We'll get to it

after we explain why the quartz-synthesized TX-11a Stereo AM-FM Tuner will impress you in your own listening environment).

A CLEANER, WIDER FM WINDOW ON THE WORLD.



Because of the TX-11a's Charge-Coupling and Leading Edge Detection technology, ownership may very well change your listening habits. Right now, you probably confine your FM listening to those stations which are strong and relatively interference-free, avoiding weak stations and those filled with distortion. Your options are therefore limited. The TX-11a can significantly expand your choices by recovering stations previously buried in hiss or prone to sudden tantrums of noise.

Ovation Magazine observed that the circuit, "... may well mean the difference between marginal reception of the station signals you've been yearning to hear and truly noise-free reception of those same signals, permitting you to enjoy the music and forget about noise and distortion."

In **Audio Magazine**, Len Feldman said "The significance of its design can only be fully appreciated by setting up the unit, tuning to the weakest, most unacceptable stereo signals you can find, then pushing those two magic buttons."

"Separation was still there; only the background noise had been diminished, and with it, much of the sibilance and hissy edginess so characteristic of multi-path interference."

WHY THE ASYMMETRICAL CHARGE-COUPLED FM STEREO DETECTOR GIVES NOISE THE SILENT TREATMENT.

Thirty years ago, the FCC turned clear mono FM into a substandard stereo medium (with fifteen times poorer signal-to-noise ratio) by approving a broadcast system that is extraordinarily prone to multipath and distant-station-noise.

This system separates stereo into two different bands. Unfortunately, the bands aren't pure Left and Right. Instead, one band is comprised of those parts of a stereo signal that are common to both channels, (L+R, or mono). The other signal, far more fragile and prone to interference, is the difference between the left and right signal (L-R). It bounces off buildings, hills and other objects, and wreaks havoc when



CARVER

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recombined with the strong mono signal.

Bob Carver's Charge-Coupling circuit takes advantage of the fact that almost all noise and distortion is exactly 180 degrees out of phase with the signal it's part of. The TX-11a Stereo AM-FM Tuner cancels these "dirty mirror" images before they can reach your ears. That eliminates up to 85% of the potential noise found in distant or noisy stations.

But Bob wasn't satisfied and knew you wouldn't be either. So another circuit, the Leading Edge Detector, goes a step further by taking advantage of a little-appreciated FM phenomenon: Just 5% of the L-R signal actually contributes to the stereo experience. The rest simply gets in the way of skyscrapers and mountains.

The Carver leading Edge Detector operates only on this critical 5% of the L-R signal, filtering out noise and restoring just that part of the signal needed by our ears and brain to construct stereo imaging.

Blended back into the mono (L+R) signal matrix, a net reduction of 93% — or better than 20dB of noise reduction — is achieved. All ambient and localizing information is recovered. Only hiss and distortion are left behind. Or, as **High Fidelity Magazine** put it, "...clean, noise-free sound out of weak or multi-path-ridden signals that would have you lunging for the mono switch on any other tuner."



THE LITTLEST AM RADIO STATION.

Before we describe the remarkable attributes of the TX-11a, we owe you the story that proves just how far performance can be extended when a component comes from Carver.

At a recent press conference, Bob Carver unveiled a small antenna connected to a very low powered AM stereo broadcast transmitter (C-QUAM format). Dubbed "Station CRVR," it sat next to a Carver Compact Disc Player and the same TX-11a that's on your dealer's shelves right now.

Bob Carver routed the Compact Disc's signal to the antenna for reception by the TX-11a, and also directly to a preamplifier.

In front of America's top stereo writers, Bob switched back and forth between the transmitted signal (as received by the TX-11a) and the direct CD signal. All listeners had difficulty distinguishing between the outputs of the CD player and the TX-11a Stereo AM-FM Tuner!

Most could tell no difference at all!

HOW AM STEREO GETS THE SILENT TREATMENT WITH THE TX-11a.

- * *Unique de-emphasis curve*
- * *Whistle Stop cancelling circuit*
- * *Pilot Signal cancelling circuit*
- * *Ultra-low noise balanced station detector*
- * *Very wide band, minimum phase intermediate frequency amplifiers.*

Think of it. Compact Disc frequency response and freedom from noise with AM stereo and the TX-11a. Only Carver could pull it off. But then only Carver could do the same for FM, too.

HUMAN-ENGINEERED FEATURES AND CONVENIENCE.

Many tuners with far less exclusive circuitry than the TX-11a have far more complicated exteriors. Bob Carver wanted to make tuning stations easy, not impress you with flashing lights or complex programming.

So thirteen presets, wide/narrow band selectors, automatic/manual scanning and the buttons which activate the remarkable Charge-Coupled circuits (Multipath and Noise Reduction) are all tastefully inset into the burnished anthracite metal face. Full instrumentation including digital station frequency readout, 6-step 10dB-interval signal strength LED's and other monitor functions is recessed behind a panel, visible but not garish.

The result is performance without theatricality. Access without complication.

A tuner **High Fidelity Magazine** called, "By far the best tuner we have tested..."

CLEAR THE AIR BY VISITING YOUR NEAREST CARVER DEALER.

Ask to hear the most expensive tuner they sell. (It won't be the Carver TX-11a). Now tune a multi-path-ravaged, hiss-filled FM station. Tune the same station on the TX-11a Stereo AM-FM Tuner and press the Multipath and Noise Reduction buttons. You'll see why no other FM tuner can approach it. And why no other AM stereo tuner this good exists anywhere!



MUSICAL

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Intermittent Hum and Noise

Q. I have a factory-reconditioned tape deck about six years old. Initially I used it for about five hours, and everything was fine. I left it alone for about one week. Then I played a tape I had made during the initial period, and heard strong noise and hum, with the music at very low level. I turned off the deck, cleaned the heads with a cassette cleaner, and demagnetized them with a cassette demagnetizer. I reinserted my tape, and everything was fine. About one week later I tried to use my deck, and again I got the hum and noise. This time I just cleaned the heads, and once more everything worked fine. What is going on?—Leslie Page, Brooklyn, N.Y.

A. I can see no reason why dirty and/or magnetized heads would cause hum and noise and reduced sound level. I believe that cleaning and/or demagnetizing, followed by restoration of normal operation, was coincidence. The problem may lie in a faulty component such as a resistor, capacitor, or transistor; the "shock excitation" of turning the deck off or on may be causing an intermittent condition to appear or disappear.

Intermittent problems such as this, which come and go almost at random, are very difficult to correct. The problem may fail to appear when the service shop checks it, or may disappear, by sheer coincidence, when the repair shop does anything to cure it, relevant or not. It may be advisable to wait until the hum and noise problem appears more consistently before taking your deck in for repairs.

Mettle of Metal Tapes

Q. Can a metal tape recorded on a high-quality cassette deck confidently be played on other decks without losing high-frequency response? Is it possible to demagnetize the heads of less sophisticated units, such as portable players or car cassette players, so that metal tape will not undergo high-frequency loss? Also, can a metal tape be stored for an indefinite period under normal conditions without loss of quality?—J. Gary Sparks, Indianapolis, Ind.

A. I doubt that your metal tapes will be harmed when you play them in relatively inexpensive cassette decks if you periodically demagnetize the play-

ers' heads—and even that should not be necessary often. So far as I know, metal tapes, like the other types, can be stored for long periods without loss of quality. However, it is a good idea to play these tapes every few months, or at least put them through fast wind and rewind to relieve stresses.

dbx I vs. dbx II

Q. What is the difference between dbx Type I and Type II noise-reduction systems?—George Rauscher, Hepzibah, Ga.

A. Type I dbx is intended for professional applications; Type II is generally incorporated in cassette decks and outboard units for consumer use. Type I offers somewhat flatter frequency response than Type II. Circuitry is different in each type, so they are considered incompatible.

Shelf Life

Q. I am concerned with the long-term use and storage of magnetic tapes, both used and virgin. Is there a "decay" factor? If a reel of tape is unplayed for, say, a year after recording, does it suffer any loss in quality? And is there some sort of shelf life for virgin tape?—Ken W. Hind, Edmonton, Alberta, Canada

A. So far as I know, the shelf life of tape is unlimited, whether virgin or recorded, assuming temperature and humidity conditions are within the range called "normal." A recorded tape may acquire noticeable print-through after storage. (The thinner the tape, the more likely this is to occur.) But most of this print-through occurs during the first hours or days of storage, so the length of time the tape is stored has less effect than the storage conditions. Print-through will be more severe under conditions of high temperature or in strong magnetic fields. It may possibly be reduced by putting the tape through fast-wind one or more times before playing it.

I gather from your mention of reels that you are using open-reel tape. If your tapes are recorded in one direction only, as quadraphonic, multi-track, and two-track stereo tapes are, you can minimize print-through problems by leaving the tape wound on the take-up spool, and only rewinding it just before playing. This forces you to give

the tape the recommended fast-wind before playing. It also renders less objectionable whatever print-through does occur, by making it appear as a natural-sounding post-echo rather than a pre-echo (something which cannot occur naturally).

Not rewinding immediately after play also leaves the tape evenly tensioned on the reel or hub, and usually more evenly wound than it would be after fast winding. This helps protect the tape from physical stretching and prevents stray windings from poking out of the tape pack, where they can be damaged in handling.

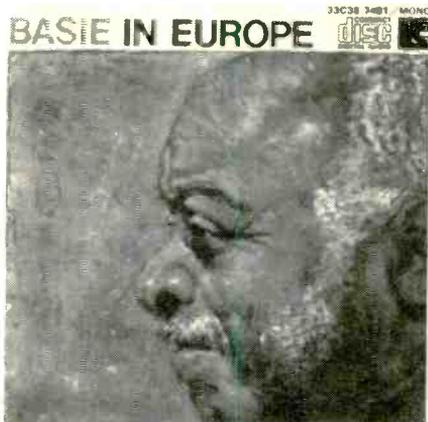
Over time, a recorded tape might lose something like 1 or 2 dB of response at the very high end, although this effect tends to be minimal with modern tapes of good quality. Such tapes should be able to undergo at least 500 passes through a tape deck without appreciable deterioration of their magnetic and physical characteristics. Tapes of lesser quality are more likely to change shape or shed oxide during long-term storage.

Efficient Bulk Erasers

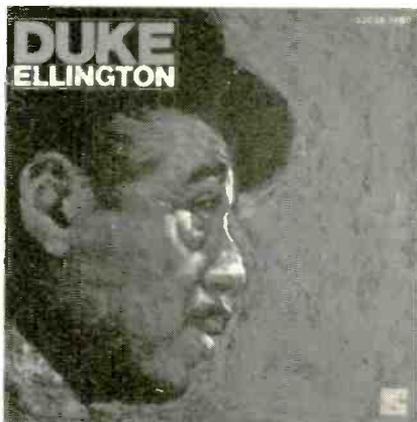
Q. I am becoming desperate to acquire an efficient bulk eraser for my large collection of cassette and open-reel tapes. My present hand-held eraser, no matter how I use it, has given very poor results; instead of removing magnetic patterns it has introduced a lot of hum and noise. I would appreciate any suggestions.—Richard Carleton, Topeka, Kans.

A. Bulk erasers that perform effectively are not cheap. They may go for anywhere from about \$75 to \$200, and possibly even higher. Among companies that make them are R. B. Annis Manufacturing Co., 1101 North Delaware St., Indianapolis, Ind. 46202; Geneva (formerly Nortronics), 7255 Flying Cloud Dr., Eden Prairie, Minn. 55344; Robins Division of Benjamin Electro-products, 232 Sherwood Ave., Farmingdale, N.Y. 11735, and TEAC, 7733 Telegraph Rd., Montebello, Cal. 90640.

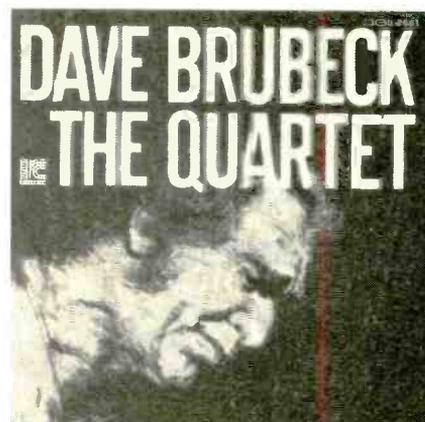
If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 1515 Broadway, New York, N.Y. 10036. All letters are answered. Please enclose a stamped, self-addressed envelope.



#C38-7481 *Count Basie and his Orchestra; Basie in Europe*; recorded live; with Whirly-Bird, Jumpin' at the Woodside. Cassette: MC-7481.



#C38-7680 *Duke Ellington; S.R.O.*; Recorded live; includes Take the A Train, I Got It Bad and that Ain't Good. Cassette: MC-7680.



#C38-7681 *Dave Brubeck, The Quartet*; Recorded live; features Brandenburg Gate, Someday My Prince Will Come. Cassette: MC-7681.

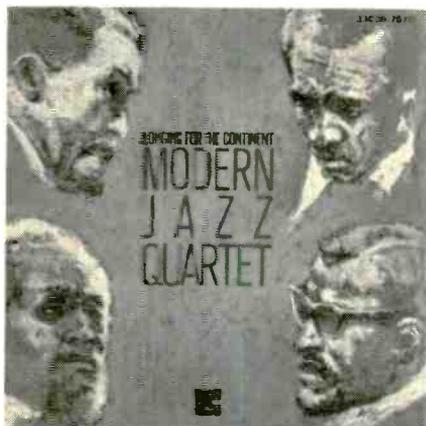
Previously unreleased Basie, Ellington, Brubeck ...now on CD and cassette.

Hear nine legendary jazz performances you've never heard before with sound quality you've never heard before. Released in conjunction with producer Sonny Lester, these new Denon CDs and high-bias cassettes capture up to 65 minutes of live performances by Louis Armstrong, Charles Mingus, Dave Brubeck and jazz aristocrats like Count Basie and Duke Ellington.

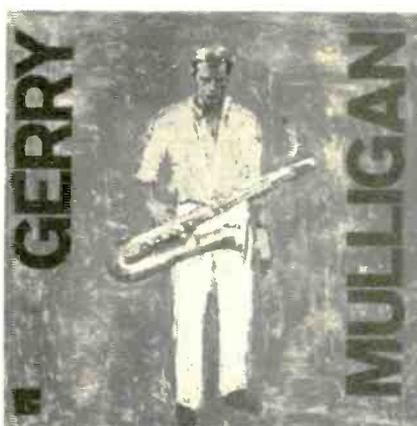
This is only the beginning. Look for more new releases that take advantage of Denon digital technology. The jazz greats have never sounded so great.

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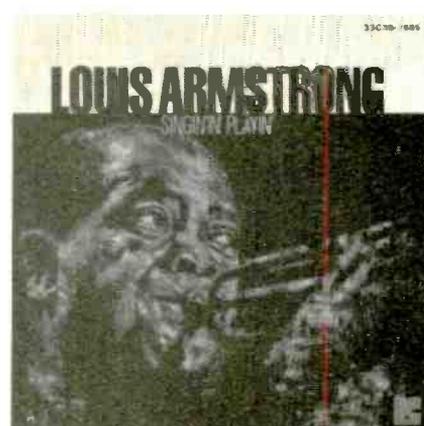
The First Name in Digital Recording.



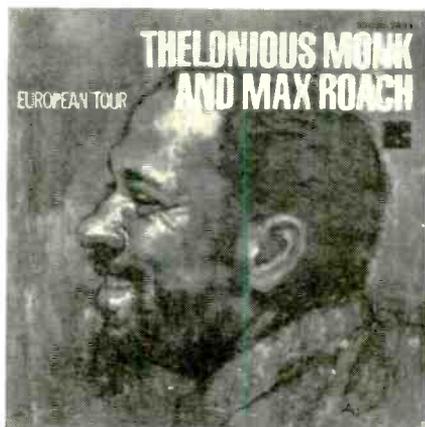
#C38-7678 *Modern Jazz Quartet; Longing for the Continent*; Recorded live; features Django, Odds Against Tomorrow. Cassette: MC-7678.



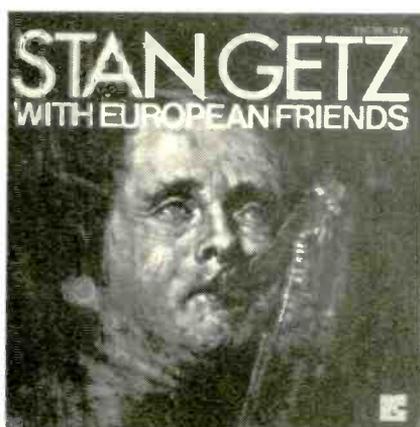
#C38-7682 *Gerry Mulligan; Mulligan*; Recorded live with Buddy Clarke, Mel Lewis, Art Farmer, Bob Rosengarden. Cassette: MC-7682.



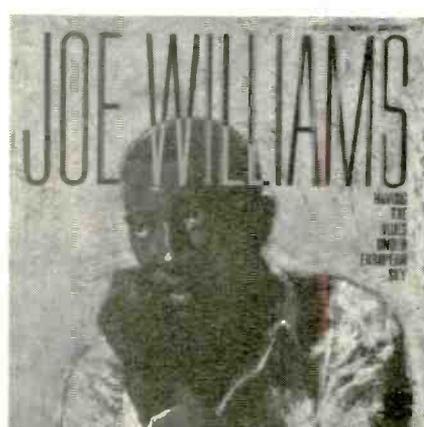
#C38-7685 *Louis Armstrong; Singin' n' Playin'*; Recorded live; features Hello Dolly, Mack the Knife, St. James Infirmary. Cassette: MC-7685.



#C38-7683 *The M'Kons Monk/Max Roach; European Tour*; with Thad Jones, Charlie Rouse, Tommy and Stanley Turrentine. Cassette: MC-7683.



#C38-7679 *Stan Getz with European Friends*; featuring Martial Solal, Pierre Michelot, Jean-Marie Ingrand. Cassette: MC-7679.



#C38-7684 *Joe Williams; Having the Blues under European Sky*; with Count Basie & His Orchestra, Ellis Larkins. Cassette: MC-7684.

HX Pro, which protects against tape saturation, isn't available as an add-on. If you have a recording problem, try lowering the level a bit.

Steady Hum

Q. My new cassette deck produces hum throughout a recording. It is particularly noticeable between selections and at low music levels. When I substitute my old, inexpensive deck for the new one, the problem disappears. I have already exchanged the new deck for another unit of the same model, but there is no improvement.—Brian Rosenbaum, Chicago, Ill.

A. First determine whether the hum occurs in recording or playback. Record a cassette with your new deck; if the hum is present when you play it back on the new deck but disappears on the old, the problem is in the new deck's playback. If the hum is present in playback on both machines, the problem probably is caused by the new deck's recording. The deck may be to blame even though you say you exchanged it. This could be due to poor design, faulty parts or construction (such as internal layout of leads), etc. It may be necessary for you to

make still another exchange, perhaps for another model or make.

It is also possible that the cables between your deck and your amplifier are not securely inserted into the jacks. Try pinching the shells of the plugs to get a tighter fit, and twist each plug back and forth as you insert it into a jack. Another possibility, if your components are stacked atop each other or are in very close proximity, is that the playback head is picking up hum coming from the transformer of another component.

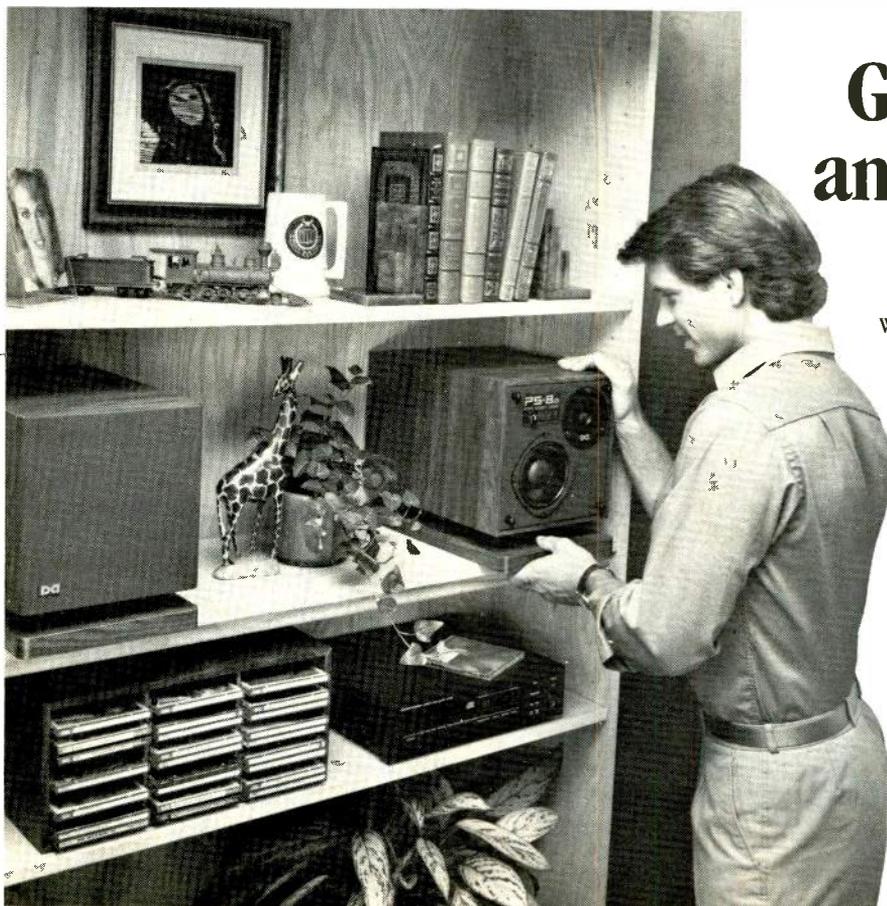
Adding HX Pro

Q. I would like to add Dolby HX Pro to my cassette deck for both playback and recording. Is there anyone who makes an add-on unit for this purpose? If not, can you suggest how I can accomplish this?—James L. Dagley, Jr., Port Orange, Fla.

A. Dolby HX Pro is used only in recording. It employs the high-frequency content of the audio signal as part of

the bias in recording. As the high-frequency content increases, the amount of bias current drawn from the bias oscillator is decreased, and vice versa. Thus the total bias—most from the oscillator and some from the audio signal—remains constant. This avoids overbiasing and the consequent loss of high frequencies. In other words, the deck provides greater headroom, i.e. protection against tape saturation by treble frequencies of high amplitude.

HX Pro is a quite sophisticated system. It would require considerable technical knowledge and skill to incorporate it into an existing deck, and it is not possible, here, to tell you how to do this. Also, there is no such thing as an add-on HX Pro unit. If your deck gives you a high signal-to-noise ratio (which it should if it incorporates Dolby C NR), and if you believe you are running into tape saturation, back down on your recording level a few dB; the decline in S/N will probably be unnoticeable, or nearly so. A



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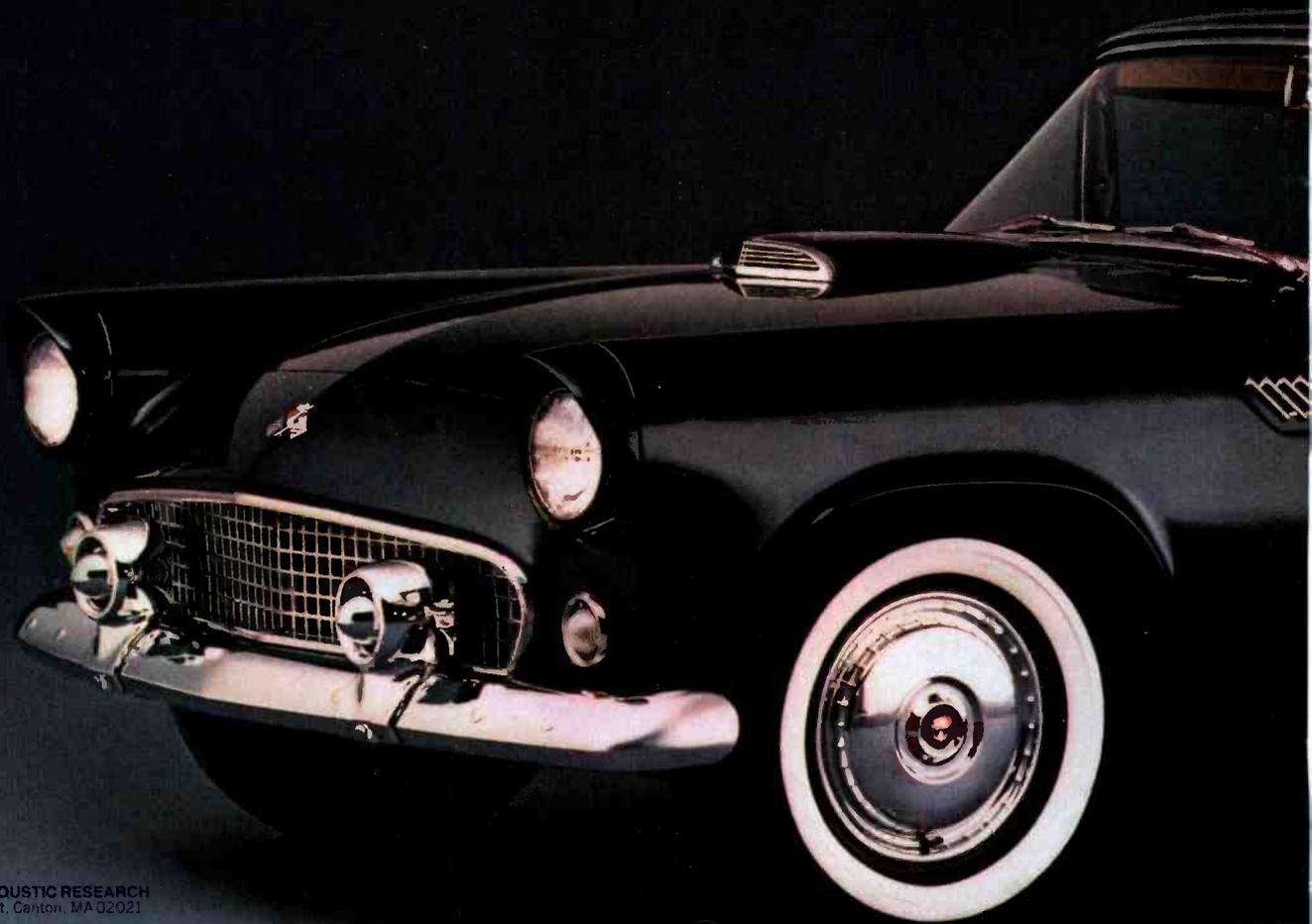


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MATTERS OF SUBSTANCE



New materials—they rule our world. If you have lived through the bulk of this century you will understand that major innovations in our jet-speed technology always begin with something new in the way of materials—either an exotic suddenly become economically viable, like aluminum, or a substance that nature hadn't thought of but man has made, like chromium dioxide. (Or, as we'll see in a minute, MetGlas.) It is the same in audio as in other areas. Give us a new material, and we spurt forward as fast as R&D will allow.

I find it always interesting, then, to gander the latest materials all over, even those that seem totally removed from the audio arena. You never can tell; they might turn into next year's sensation. I'll admit I get much pleasure just watching the reports, and speculating. More fun than lottery numbers and about as likely to pay off.

I can remember when aluminum first appeared in the consumer world and elsewhere, after a quarter century as an expensive exotic. Quite sensational and very handsome. It revolutionized the kitchen, of course—I can still see

my mother's old iron skillets and greasy, rusty frying pans, the heavy crockery and jugware, the chipped enamel, the nickel-plated counter tools with the wooden handles, red or green, that quickly split and came off. And those massive meat grinders with curved metal handles, disassembled after each grinding—a child's heaven. Priceless antiques now, but aluminum was a huge improvement. There was duralumin too, for aircraft frames, formerly patched up out of balsa wood and steel wires. The old Graf Zeppelin used to mosey over New York every few weeks, casually, and I would glance up at it. The Hindenburg also would fly over; I saw it blow up at a distance, from Princeton, N.J. All this and more was due to the sudden abundance of one formerly scarce metal, aluminum. It came in so fast (via the electrolytic process) that we never got to agree with Europe as to how to spell it or say it. In England, they say "al-you-MIN-ium," spelled aluminium.

We haven't used much aluminum wire in audio circuitry, but about 50% of our hardware is still made of that metal. It dealt us a sidelong glance.

Plastics are another story—they make up not only a million audio parts, large and small, but our basic recording media, disc and tape. As you probably know, the first magnetic tape was solid spring steel, wound on enormous, heavyweight reels; you could "edit" these, I've heard tell, with solder and a blowtorch. Even so, this system was used very practically for delayed broadcasts. After that—still without modern tape—we went to the opposite extreme, paper tape. I remember that stuff all too well; I used it on the first home tape recorder, the Brush Soundmirror. Just shows how much we needed the later array of plastic materials, which did not appear until after WW II, for the most part. But then the vast spread of new plastics set us up in audio for much of our later development, and don't forget such incidental items as rubber-plastic insulation on circuit wire. Did you ever work with one of the old pre-plastic household electric cords, wound with several layers of cloth insulation which came undone, unwound, and shredded into snarls? Insulated wire had been a problem since the beginning of the use of current electricity.

You never know. Usually, when one of these basic new materials appears, it is a substance looking for a use. The original promoters have ideas but they are often off the mark. Like Edison's dictating machine, out of the talking machine, which didn't get to be a music machine for a long time. Usually, unexpected uses pop up and change history. Often, of course, the material itself is an accident, discovered en route to something quite different.

When I first heard of that new synthetic material, chromium dioxide, newly wrought in a fiery furnace by DuPont, I rushed right out to the introductory press conference, because this was a highly magnetic substance that could be pulverized and coated onto plastic tape. It was already being used for tapes on big old mainframe computers. So why not for audio? A chrome tape would outperform existing audio tape in important ways.

That event, as I remember it, was a genial farce. DuPont wasn't talking. A curious factor, corporate secrecy. Yes, chrome was being promoted for computer tapes. Was there any thought of

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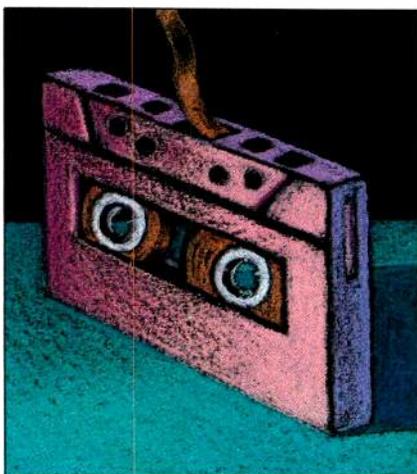
a chromium dioxide audio tape? Polite silence. Yes, they said, we are producing computer tape, right now, with this material. Period. As bland as you please. But nobody got a word out of them, as I remember it, concerning professional and consumer audio tape. Why? Business strategy, we will suppose.

I might add that, as often happens, chrome stimulated improvements in the nonchrome tape formulations that still continue today, reducing the once considerable difference in performance to a much finer distinction. So we have both kinds still with us. And we still look for improvements. Note the same thing happening between the LP and the CD—the LP has never been finer than in these years of its competition with the CD.

In spite of digital everywhere, we continue to search almost frantically for more efficient ways to record via the magnetic medium. It is still our base, both in audio and video; only the various disc formats—the audio products “published,” so to speak, with indelible ink—are nonmagnetic. But the enormous efficiency of the microchip, of the little CD with the big play, of the movie-on-a-disc, all force us to look for any possible avenue of improvement that might mean more and better magnetic recording on less tape—and we are moving. A few years ago, 8-mm video (with audio attached) seemed highly unlikely. Now it is already beginning to do what the much larger formats can do. We are holding our own, magnetically, but barely. Improvements are welcome, especially radical ones.

MetGlas. That may sound to you, as it did to me, like some unpleasant kind of medicine. But one look at the pictures in a fancy stockholders' brochure out of Allied Signal, the new giant combine of two major outfits, told me otherwise. Did I jump in surprise! What was *that*? It looked like recording tape. It wasn't recording tape.

MetGlas is a wholly new form of metal alloy that apparently has never existed in nature or, until recently, via man's tricky handiwork. As the name actually implies, it is a true *glass*, all metal. That is, there is no regular crystalline structure, only an amorphous mix of molecules in random order. This gives the alloys—a whole family of them—some



remarkable new properties. First of all, they are highly magnetic, far more so than pure iron. Second, they are produced in flat ribbon form, not in castings; they spin off a whirling wheel onto take-up reels. No, not audio or TV reels! The system is derived from Allied Signal's fiber operations, far removed from any thought of recording. The reels just look like TV. And the ribbons of flexible metal just look like, say, 2-inch video recording tape. A rich, reddish brown in color, obviously thin enough to wind and curl in any direction or maybe lie flat. Astonishing. For an audio eye and a video eye, anyhow.

“Standard alloys with aligned or crystalline atomic structures,” says Allied Signal, “usually have a few missing molecules because manufacturing processes are imperfect.” (Here my mind ran on the glitches and drop-outs in audio tape, and those digital errors that require the elaborate correction systems we now have in place.) “Amorphous structures, like MetGlas alloys, do not have these imperfections, so they are stronger and harder.” And maybe less subject to irregularities that might foul up a magnetic recording? That's what I would think. Compare this to an optical lens made of absolutely uniform amorphous glass. Think of the accuracy of a telescope! That's glass for you.

MetGlas seems to be based on iron, variously alloyed. We in audio have already been able to produce a pure-iron recording tape of the standard coated sort, though not before there were actual explosions due to very

rapid oxidation of the pure metal. That problem was solved, laboriously but triumphantly. Now we are looking at an amorphous alloy which is far superior to iron in its magnetic character and which features an inherent resistance to corrosion; if it could be made into a solid-metal tape, there would be no problem in that respect.

I think it is a nice speculation. The company says that MetGlas, sort of a cross between a sheet of metal and a metal foil, is “both flexible and tough.” Could there not be a thin metal ribbon of it, thin enough, strong enough, to reel properly on a machine or in a cassette and to lie down flat for head contact? A tall order, I'll admit, one probably requiring much R&D and a lot of juggling of parameters. Still—it *might* be possible.

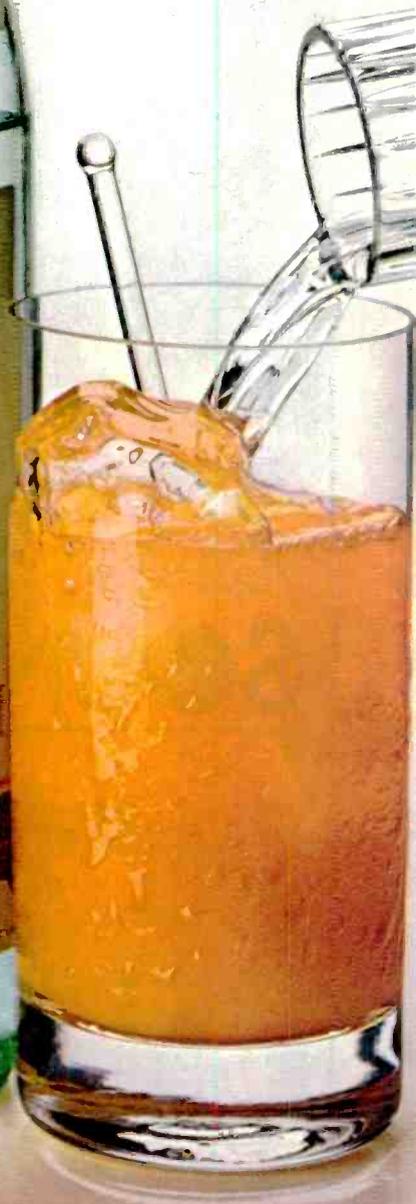
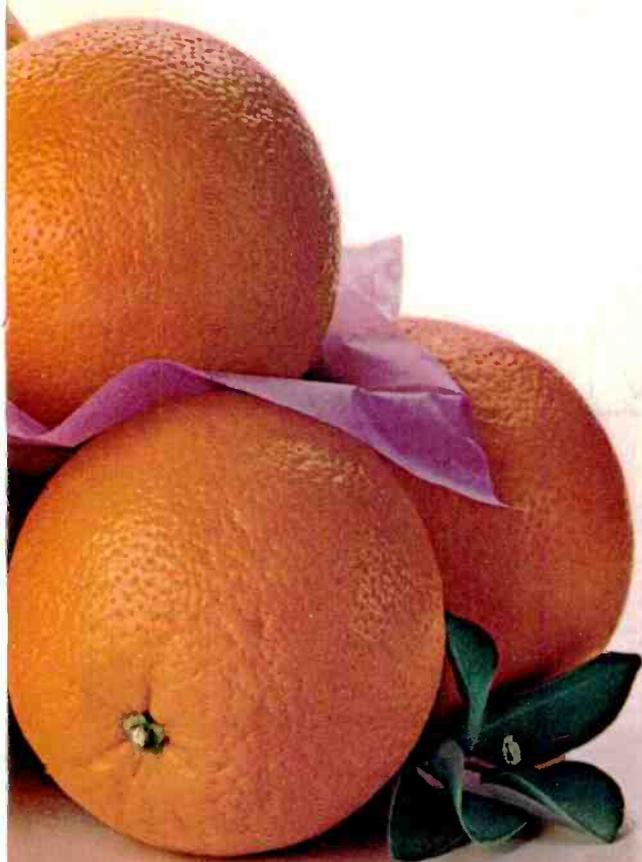
Keep in mind two points. First, there is no mention whatsoever of audio or video recording in Allied Signal's account of MetGlas. That is strictly my idea. Unless, of course, they are being cagey and not saying. The initially described applications for MetGlas include, for instance, using it to make magnetic elements in large utility-type transformers. There are evidently small stamped and shaped parts of MetGlas in some new VCRs, a metal glass obviously being good for that kind of processing. (I would suppose these are magnetic elements in motors, relays, and the like.) MetGlas appears in high-speed computer printers, heat exchangers, and more—always as a magnetic metal alloy replacing standard formats for dramatically improved performance. This substitution market is so promising that the company figures a \$6 billion world market in electrical steels might be entirely replaced by MetGlas, part for part. But a MetGlas “tape” for recording? Not a word! That's just my idea.

Second, note that this would never be a recording tape in the usual sense, a plastic base coated with magnetic material. It would be uniformly metal, all the way through. No coating, just the pure alloy. And yet maybe, even so, it could operate as a *de facto* tape that could meet the required specs, both mechanical and magnetic. So I am guessing. Somebody else will have to find out.

MetGlas was discovered, or invent-

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To produce a given magnetic field, MetGlas requires 70% less power than conventional silicon iron. Doesn't that say *something* to you?

ed, some 20 years ago at Allied. However, as with aluminum, which could not be produced in quantity when it was first isolated, MetGlas was not amenable to mass production. We are all aware that if you want small crystals you must *cool fast*, whether in metal or plain old ice. The faster the cooling, the finer the crystalline structure. This applies to the whole complex of metalworking technology over millennia, along with bending, pounding, kneading. Quenching is the old metalworking term for quick cooling—you dunk a red-hot piece of metal in a pail of water, for instance. It follows that, to make an amorphous and noncrystalline metal, you must quench at enormous speed. How to do it? Not like the village blacksmith. That was the problem with producing MetGlas.

The new MetGlas process pours hot, liquid metal onto a wheel spinning at a tremendous rate; the metal is whirled and simultaneously cooled at *one million degrees C per second*, solidifying in less than a millisecond. It flies off continuously in a ribbon, to be collected on winding machines which are definitely not tape recorders, though they may look like it. That's how it is done, roughly speaking. No wonder it took a while to work up to mass production! I'd call this a 2,000-year breakthrough in metalworking technique. Beats even Bessemer.

What are the magnetic properties of MetGlas? All-important, of course, but we aren't told very much. (Maybe you could pry the specs out of the company if you tried.) Suffice it to note that MetGlas requires 70% less power to produce a given magnetic field than a conventional magnetic silicon iron. Not our usual terminology, but doesn't that say *something* to you? Does your hair stand on end?

MetGlas, of course, *must* be made in a tape-like ribbon because of that instant quenching. It is inherently tape-like to begin with. A thicker MetGlas wouldn't quench. Not to an amorphous state, anyhow.

Final thought: Suppose we quenched at half speed to produce billions of neat little molecule-sized magnetic domains, nicely patterned? You could tailor the structure to suit recording purposes—just maybe? Well, it's a good fantasy, anyhow. **A**

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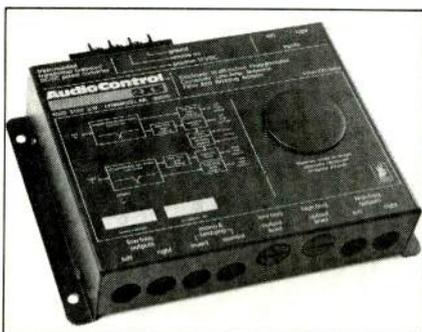
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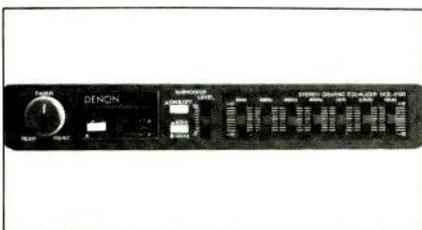
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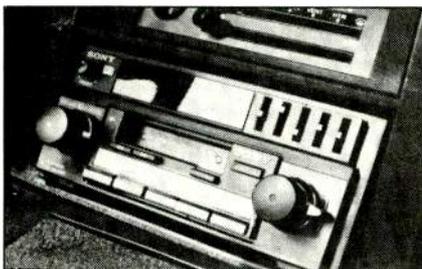
Audio Control's 2XS crossover has both mono and stereo subwoofer outputs.



Hifonics' Ceres: The first true parametric for the car?



The Denon DCE-2150 equalizer spaces its bands more closely below 1 kHz than above.



Scosche's Rack allows a half-height equalizer and head unit to be put into Detroit dashboards.

At January's Consumer Electronics Show, I visited all the car-stereo exhibits I could, except for those that were outdoors—the fancy, super-power car installations, each turned up to outshout its equally loud neighbors. This is power for power's sake, and although some of these installations can sound superb at real-world levels, there's no way to assess them over the din. "It's another planet out there," said Greg Mackie of Audio Control, after wincing his way past the blare.

Mackie's company has expanded its own car-stereo line a bit, still emphasizing music over macho. The EQX combination crossover/equalizer has been split into separate units, for installers who don't need the combination. The \$189 EQL repeats the \$299 EQX's unique equalizer setup, with five half-octave bands in the tricky range from 45 to 180 Hz, and seven octave bands from 180 Hz up to 16 kHz, all designed to be set by the installer and then left alone. To keep owners and their friends from messing up the settings, the EQX and EQL are designed to be mounted in the trunk and have flat knobs that require a coin or screwdriver for making adjustments. Audio Control now also offers a screw-on cover with a space for the installer's label. (I suggested that installers also mark the covers with tape seals; this would make it easy to tell whether customers have meddled.)

But how does the installer know just how to set the equalizer? Doing it by ear is often imprecise and always slow, so Audio Control will offer installers a one-third-octave spectrum analyzer, the SA-3050, at a ridiculously low \$550 or so, plus about \$110 for its calibrated microphone. The analyzer will operate from rechargeable batteries as well as house current, so it can be used in the field or even while the car is moving. It will have several memories, plus provisions for integrating the input from several microphones, to smooth out local variations in sound response.

Audio Control's new 2XS crossover (\$99) offers another convenience to the installer: The plug-in network which sets its crossover frequency can be mounted on the end of an extension cable, so installers can sit inside the car to hear the effects of changing

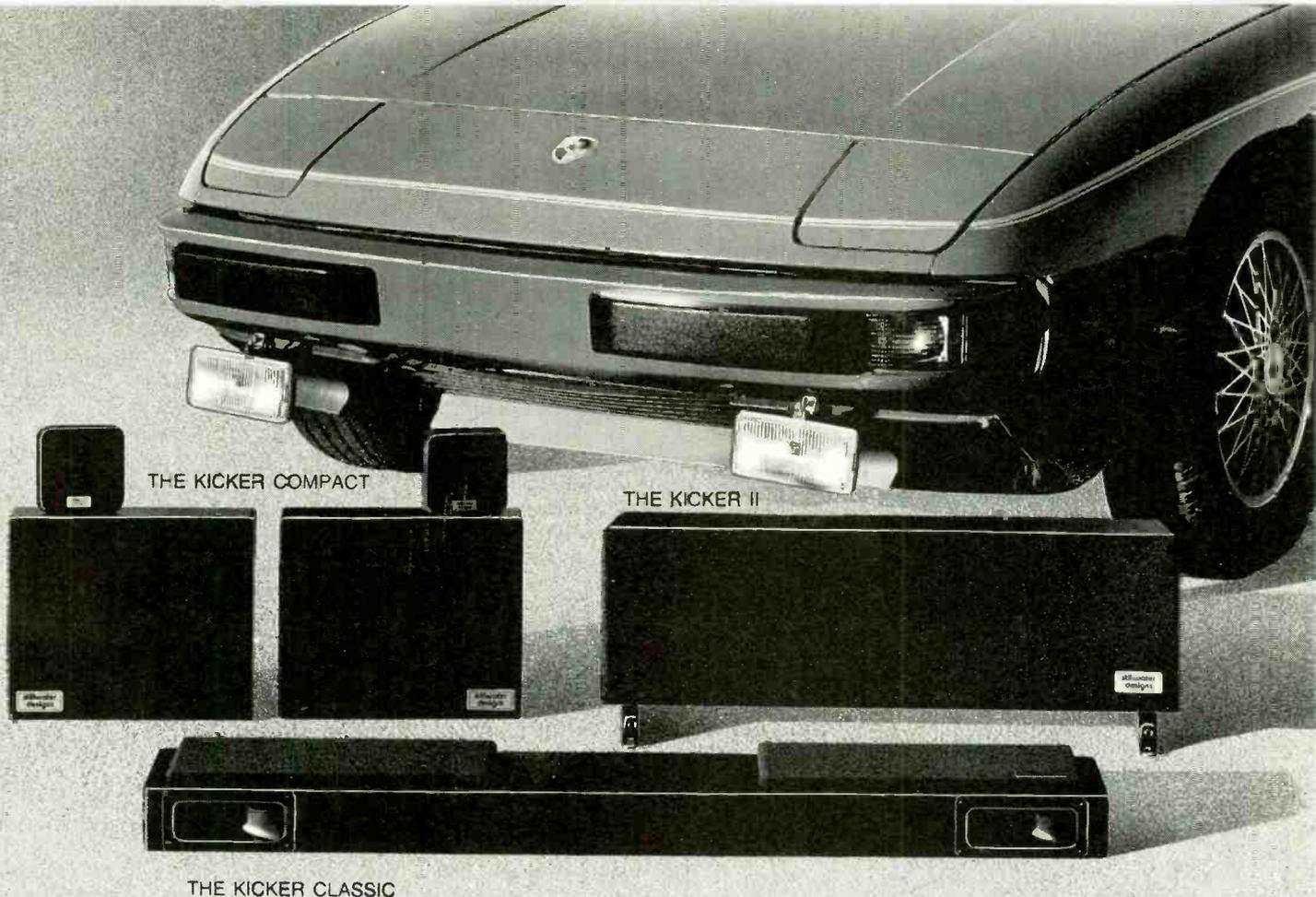
crossover points. Both mono and stereo subwoofer outputs are built in, as is an inverted mono output for bridging. The 2XS also has a subsonic filter to deal with the ultra-low frequencies found on some CDs.

Mackie decries the common practice of leaving a response notch at the crossover point to counteract the effects of the car's resonances. It can work, but only when the desired notch falls at a crossover point that's right for both the woofer and subwoofer, a coincidence the installer can't rely on. "Equalization," Mackie feels, "should be left to equalizers."

And there were equalizers aplenty at the show. A growing number were, like Audio Control's, designed to be set up by installers. Rockford Fosgate's OEQ-1, for instance, requires a jeweller's screwdriver to set the amplitude and center frequency of each of its nine bands. The boost and cut is limited to ± 9 dB, allowing more precise control than the more common (and seldom needed) ± 12 dB range; center frequencies of each band are adjustable over a half-octave range. A bypass switch simplifies comparison between the original and the equalized response.

Hifonics claims its Ceres (\$400) is the first true parametric EQ for the car, with front-panel control of boost and cut (up to ± 20 dB for very narrow frequency peaks or dips, less for wider ones), bandwidth (0.16 to 2 octaves per band), and center frequency (in three overlapping ranges). The Ceres also has a switchable external-processor loop to permit insertion of active crossovers before the front/rear fader circuits; this allows constant low-bass level at all fader settings. There are also separate CD and radio/cassette inputs. The control design suggests that the Ceres is meant to be placed out in the open; this strikes me as an invitation to disaster, since parametrics are easy to misadjust if you try to set them by ear, especially if you're driving at the time.

I'm not quite sure about the Ceres claim of primacy. Zapco's four-band PX (\$480) has long allowed adjustment of both center frequency and bandwidth, albeit by plug-in modules rather than built-in controls. To compound the confusion, Zapco calls the PX a para-



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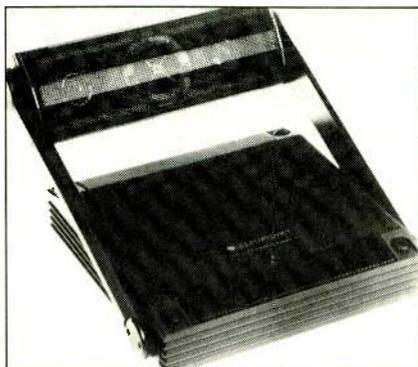
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Equalizers are becoming as diverse as the cars they go into. New models include parametrics, as well as trunk-mounts with and without remote controls.



For easier installation, some amps (such as this Alphasonik A-4018) have both DIN and RCA jacks.



Blaupunkt's radically styled MD 5054: A whole new angle on treble.



Phase Linear's new speakers use graphite cones.

metric in their spec sheets, but prints "Paragraphic" on its control panel. (Incidentally, a 120-V power supply is now available, allowing the PX to be used in home or pro applications.)

Precision Power's PAR-224 (\$250) is definitely paragraphic. Center frequencies, but not bandwidth, are selectable for each of its four bands. The center-

frequency selections seem well chosen, spaced a quarter octave apart in the critical mid-bass (150 to 240 Hz), a half octave apart in the sub-bass (30 to 90 Hz) and treble (6 to 16 kHz), and a full octave apart in the midrange (500 Hz to 4 kHz). Since the center-frequency selectors are hidden away, user fiddling should prove no more disastrous than with a graphic equalizer. Like the Ceres, the PAR-224 has dual inputs for CD and radio/tape units.

Another Precision Power equalizer, the EQM-300 (\$75), has *no* knobs or switches. Its characteristics depend upon which of its output jacks you use. One pair gives a sub-bass boost of 10 dB at 50 Hz to overcome road rumble, a second pair gives a 6-dB cut at 200 Hz to minimize car resonances, and a third pair gives both at once. It's a cute, quick, inexpensive fix for several common problems.

Coustic's EQ-1030, on the other hand, gives you not just the usual controls but the means to set them accurately. Exemplifying a trend I mentioned in the March issue, this equalizer has its business end buried in the trunk but is controlled remotely from the passenger compartment. The compact control section, a mere 3/4-inch deep, includes a seven-band spectrum-analyzer display to match the seven EQ bands, plus an input for its calibrated microphone. Since the mike is not mounted in the unit, you can equalize response to be acoustically flat where your ears are, not where the analyzer is mounted. Once you've completed your analysis, you can store your desired EQ settings in one of the four user memories. Setting the EQ bands is slow because you can access only one at a time; you have to cycle through the bands with a selector button before pressing the boost/cut keys to adjust each band. But on the road, you just select the memorized curve you need, or remove all equalization from the system.

The EQ-1030 also includes a CD input (on the front panel of its control unit) plus dbx noise reduction for playback of dbx tapes if your head unit lacks that NR setting. (Coustic's one-piece EQ-1020, \$250, has dbx NR and a CD input too.) A crossover is built onto, not into, the 1030, so it can be removed and placed on an extension

cable, allowing the installer to adjust it from inside the car.

The convention of even spacing between equalizer bands is changing. There's a definite trend towards spacing the frequencies more closely below 1 kHz than above. This is seen not only in the Audio Control EQL and EQX, but also in Denon's new DCE-2150, a half-DIN-sized seven-bander which uses octave spacings between 50 and 400 Hz, then 1½-octave spacings for the three bands from 1 to 10 kHz. Some Pioneer models do the same.

Two bits of news for Detroit fans: Scosche now has \$28 rack kits permitting half-height equalizers to be mounted with normal-size radios in Ford, Chrysler, and GM cars and trucks. And Zapco has developed a seven-band graphic EQ and a subwoofer amplifier to be used in factory-installed Ford systems.

In power amplifiers, a number of home audiophile ideas are taking root in the car. Zapco, for example, offers an energy-storage module as an accessory for two of its amplifiers, an idea I first encountered in a Dynaco home amp. With the Dyna, though, the module was designed to increase output power; Zapco's version increases the low-end bandwidth to 16 Hz at full rated power and keeps distortion to a minimum at 1-watt output levels. Soundstream has joined Alphasonik in the manufacture of Class-A car amplifiers. Several makers are bragging of their high current capacity and ability to handle 2-ohm loads (even more of a necessity in the car than at home). Proton's DPD (Dynamic Power on Demand) circuitry, with its high 6 dB of headroom, is now available in two of the company's car amps, the 75-watt-per-channel D275 and the 30-watt-per-channel D230. Rockford Fosgate now has several MOS-FET models. Denon's DCA-3175 boasts of non-negative feedback and "non-switching Class-A" circuitry, the company's way of combining Class-B efficiency with Class-A freedom from switching distortion.

Of course, these amplifiers also have design features specifically for the car. That Denon amp, for instance, has a shallow chassis and a new heat-sink design, so it can be mounted beneath a car's seats. A few more amplifiers use what Soundstream calls

Several manufacturers, most of them European, now offer speakers with tweeters that angle up and out from the axis of the woofer.

"staggered" power, with one power level for the front channels and a higher one for the rear. Soundstream's SF90, for example, delivers 15 watts to each of the front channels and 30 watts to each in the rear. Precision Power's PPI-4050 delivers 40 and 50 watts per channel, with the rear amp bridgeable to 150 watts mono for sub-woofer use. Amps with both RCA and DIN connectors, for easy hookups to a wider range of head units, were offered by Alphasonik, Coustic, and even that bastion of DIN connections, Alpine. Monolithic's PA-2400F has an internal, remote-controlled fader. A couple of Rockford Fosgate amps have independent inputs for cassette and CD, plus adjustable EQ which boosts the very high and low ends. The company says this is to overcome acoustic problems in cars, but it seems to me like the usual boom-and-tizz settings that lo-fi fans dial into their dashboard graphic equalizers.

"Subwoofer amplifiers" are growing common; usually, the name signifies a high-power monophonic amp or an amplifier with a built-in crossover. Linear Power's Servo Subwoofer amplifier is a bit more specialized. It's designed for use with dual-voice-coil subwoofers, but rather than using one voice-coil for each stereo channel, it uses one to drive the speaker and the other to generate a feedback signal which controls the amplifier's operation. That kind of feedback wouldn't be fast enough for use above 500 Hz; Linear cuts off the amp's output above 200 Hz, just to be conservative. The amp's 175-watt output is divided between two output channels, but both share a common signal input and a common servo control circuit, so this is effectively a monophonic unit.

Some of Linear Power's larger full-range amplifiers use another innovation, a power supply that can be configured to different output voltages. This allows the balance between current and voltage for a given power output to be matched to the load—more voltage and less current for higher impedance speakers, more current and less voltage for lower impedance ones.

In speakers, not much caught my eye. Ultimate Sound and Sharp now offer honeycomb drivers. Jamo has a self-powered, biamplified model, the

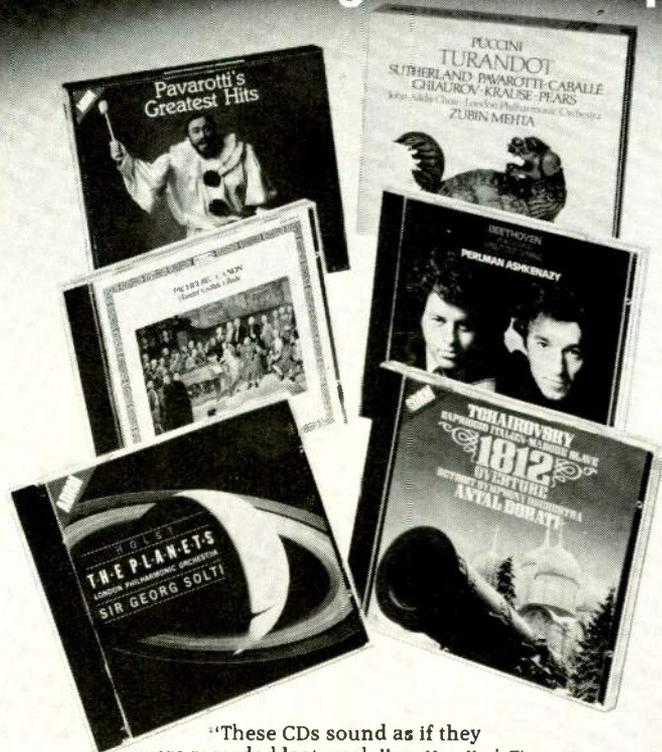
Jamocar 305. Several companies, mostly European, have speakers with tweeters that angle up and out from the woofer's axis; Blaupunkt's MD 5054 is the most radically designed of these, with its tweeter in an adjustable housing which the company compares to a racing car's spoiler. Phase Linear's

new speaker line has woofer cones made of graphite-fiber composite to reduce energy storage.

Now we all have a few months to catch our breaths before the next go-round of new products, en masse, at the Summer CES. In our next episode, we resume our usual technochat. **A**

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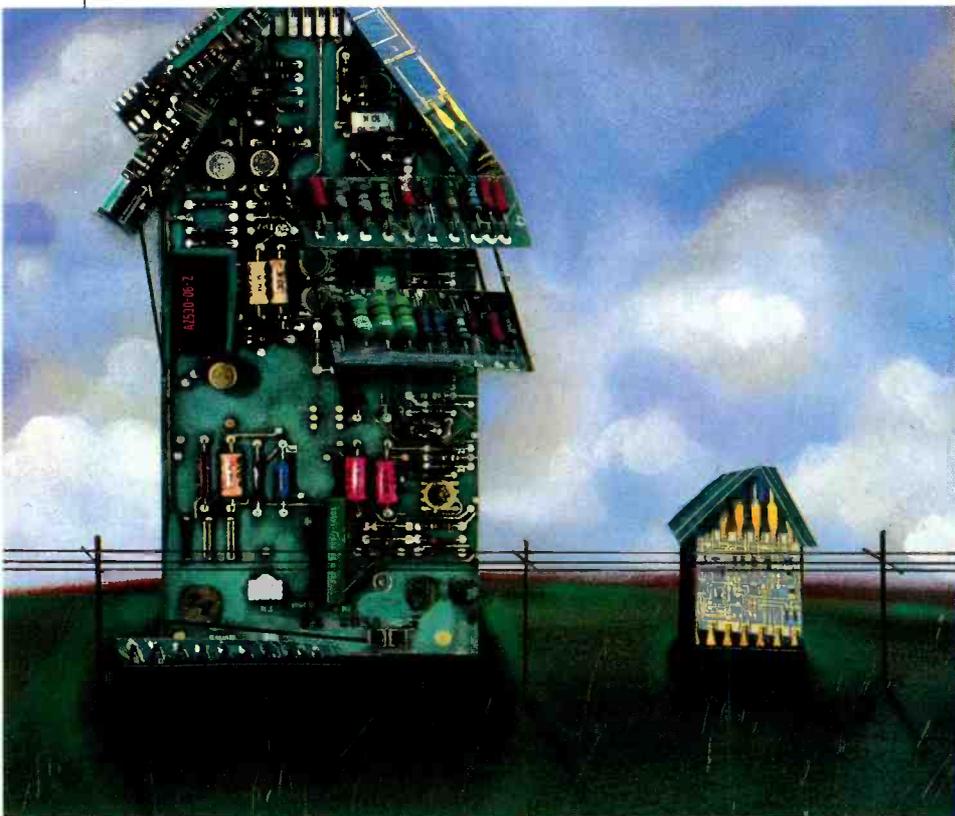
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CHOICE CHIPS



The economics of digital audio technology is considerably different from that of analog audio. One reason is that digital more readily lends itself to integration. When circuitry is reduced to a chip, several interesting things happen. First, everything gets a lot smaller. Instead of a king-sized circuit board populated with several thousand transistors and other discrete components, you've got something the size of a caterpillar (the insect, not the earth-moving tractor). Furthermore, power consumption is dramatically reduced, thereby decreasing the size of power supplies or batteries.

But cost, the bottom line, is the most interesting asset of integration. While the development cost of a new chip can be very high, the manufacturing costs are quite low. If the development costs are amortized over the market life of the chip, and divided over the number of chips sold, the cost per chip is about as small as the microcircuitry itself. In addition, the costs of labor, packaging, and shipping of the finished product are all lower. The result

is a product that is smaller, lighter, less sensitive to environmental changes, less power-hungry, more reliable, and cheaper—all thanks to chips.

Compact Disc players exemplify the benefits of digital micro-electronics. A CD player without chips would probably be the size of a Winnebago motor home, consume the power required for a Grateful Dead concert, and cost more than you could ever afford; it wouldn't sound very good, either. Its hundreds of circuit boards would be extremely unstable, particularly when the temperature changed. Even with a full-time engineer crawling around inside to adjust potentiometers, fluctuations would make a joke of operating tolerances.

It follows that manufacturers are anxious to reduce CD player circuitry to the smallest possible number of chips; that objective, in fact, is shaping the evolution of player design. The most recent step forward in this quest comes from Philips, co-inventor of the CD system. Philips has developed several new chips specifically for the CD (and CD-ROM) system. The new chips,

and the rest of the circuitry for a complete CD player, are shown in Fig. 1. The three principal decoding chips, SAA7210, SAA7220 and TDA1541, replace six earlier chips. The SAA7210 handles demodulation, error correction, and basic interpolation. The SAA7220 contains circuitry for enhanced interpolation and a phase-linear digital FIR (finite-impulse response) filter. The TDA1541 is a dual 16-bit D/A converter chip.

For design flexibility, the I²S (inter-IC signal) format is used between the SAA7210, SAA7220, and TDA1541 chips; this is a bus with separate lines for serial data, left-right channel selection, and clock (timing) data. Using this bus, the SAA7210 and TDA1541 could be connected directly, omitting the SAA7220; this would allow, for example, a low-cost player to skip digital filtering and use a downstream, brick-wall analog filter instead.

Of course, the time and trouble required to compress circuitry into fewer chips is worthwhile only if the opportunity to provide better performance is seized. In this case, the three new decoding chips offer some significant improvements.

One aim of the IC designer is to reduce the number of external components required by the chip. In the case of the SAA7210, its predecessor had nine resistors, five capacitors, a varicap diode, and a balanced differential filter. Messy. The new chip requires only a single resistor and two capacitors outboard.

Part of the SAA7210's job is to process subcode information—the non-audio data representing track numbers, playing times, titles, etc. In the old design, the control processor wasted a lot of time trying to process every bit of subcode as fast as it arrived. Now, the SAA7210 decoder collects the subcode data and sends it to the processor only when the processor requests. If the processor requires only a portion of the subcode, such as a track number (contained in the first 16 bits of the frame), it can reset the SAA7210, returning it to subcode collection.

The SAA7210 is also responsible for a share of the chip set's error handling—in this case, error correction, using the Cross Interleave Reed-Solomon Code (CIRC). The CIRC is stan-

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Anthony Cordesman

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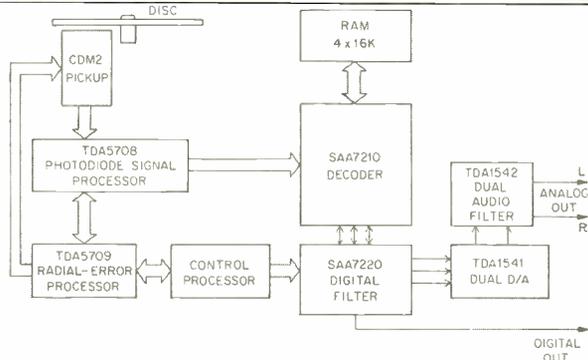
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The new error-correction circuitry is adaptive, meaning that it can discriminate among types of errors and apply the appropriate strategy.

Fig. 1—Block diagram of a CD player using the new Philips chip set.



standard for all Compact Discs and players, but the SAA7210, unlike other decoders, uses adaptive error correction to discriminate among types of error. This makes better use of the CIRC capability, permitting correction of longer burst errors (up to 15 frames versus seven frames for the old decoder) and making corrections more reliable. All decoders use error flags to pinpoint troubled data, but the SAA7210 uses extra flags. The optimum error-correction strategy (out of 60 possibilities) is selected by a flag processor, depending on the type and number of flags raised by disc defects. After-correction flags are generated and compared to incoming flags to fine-tune the strategy. The various strategies are programmed in the SAA7210's ROM and can be altered for non-audio CD applications which might call for different approaches.

The SAA7210 must also communicate with random-access memory (RAM); a FIFO (first-in, first-out) memory is needed to de-interleave data and to buffer data-rate irregularities. The SAA7210 is designed to operate with a 4 x 16K RAM which accommodates 64 frames of data, compared to the old four-frame RAM of first-generation players. Among other benefits, the larger FIFO memory will help smooth data disruptions occurring in car and portable players.

The SAA7220 is a digital filter—essentially a shift register—that moves the data bits along, one bit at a time, to create a comb filter. The shifting creates a time delay; if delayed bits are tapped off and added to original bits, cancellation occurs at selected frequencies. By timing things just right, the appropriate high frequencies are filtered out.

The SAA7220 digital filter chip also does error correction. Those too massive to be corrected by the SAA7210 decoder are passed on to the SAA7220 chip, together with the error flags mentioned previously. An interpolator on the SAA7220 masks uncorrected errors (up to eight samples long, versus one sample for the previous chip set) to create a smooth bridging waveform over the bad samples. When errors are too large for correction or interpolation, the chip repeats the last valid sample until a new one can be found, instead of muting the output as the earlier chips did.

The new filter chip offers several other advantages over its predecessors. The number of taps has been increased by 24 per channel, to a total of 120. Pass-band ripple has been reduced to +0.02 dB to lessen the possibility of its being audible. (Experiments have shown that pass-band ripple as small as +0.2 dB can be heard.) And the SAA7220 continues in the Philips tradition of four-times oversampling. The oversampling technique has several advantages, but one of Philips' original reasons for using it—to get 16-bit performance from a 14-bit converter chip—is now gone: The new TDA-1541 is a full 16-bit D/A converter.

An even more significant improvement is that the TDA1541 (which shares with its predecessor a dynamic-element matching design) is a *dual* D/A chip. Many CD players use a single D/A converter, multiplexed between the two stereo channels. This can cause switching distortion and interchannel timing error. If the two channels are mixed after the timing error occurs (as they would be for monophonic listening or for FM stereo transmission), the delay will cause a comb-filter

effect, just as it does in a digital filter. But with dual D/A converters, there is no delay between channels. And since the TDA1541 has two such converters on one chip, there is no chance of mismatched performance or thermal drift between single D/A chips. Internal bit-switching is performed with a nicely designed, fast and accurate diode transistor configuration; there's no need for external deglitching circuitry.

The TDA1541 also looks ahead to the possibility of digital signal processing, such as the use of digital tone controls. Such processing increases the dynamic range of the output signal when selected frequencies are boosted. When the 16-bit TDA1541 is coupled to noise-shaping circuits to shift quantization noise out of the audio band, 18-bit resolution can be achieved. The "extra" two bits represent a 12-dB increase in dynamic range, which allows selected frequencies to be boosted 12 dB while still maintaining a 16-bit dynamic range over the audio band.

To wrap things up, the audio output is handled by the TDA1542 filter chip. Digital filtering cleverly shifts frequency components away from the audio band, but they reappear again at higher frequencies. For example, with the four-times oversampling of the SAA7220, a band 44.1 kHz wide is centered around 176.4 kHz. The TDA1542 removes that artifact with an active third-order Bessel filter. It doesn't require any external electrical components so it is physically small, low in noise, free of aging effects, and needs no adjustments.

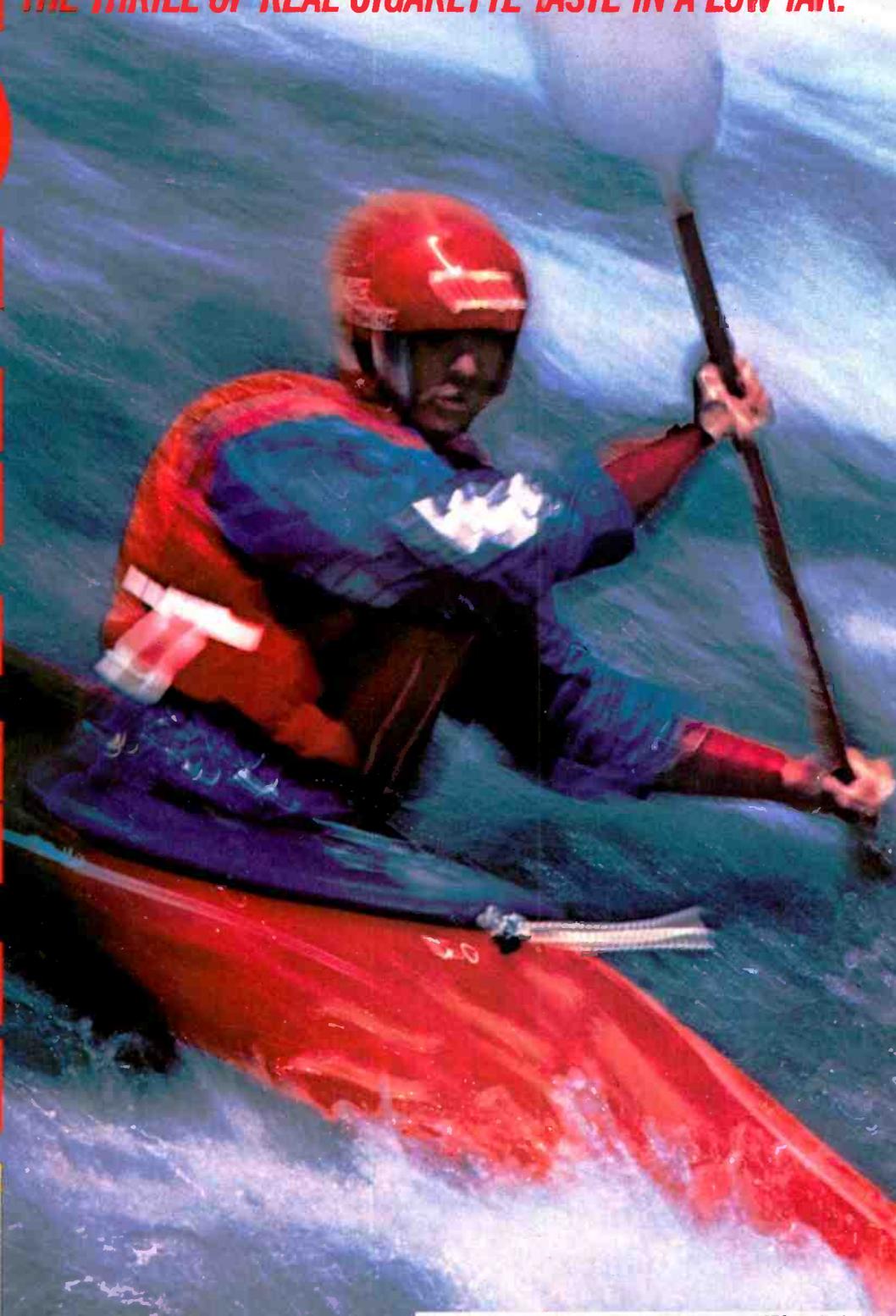
Obviously, the Philips engineers aren't letting any grass grow under their chips. This new crop offers significant improvements over first-generation chip families. Those improvements reduce player cost, size, and power consumption, while improving reliability and audio performance. Of course, great chips do not always a great player make. You can decide if they do, in this case, when you audition the Philips (Magnavox) CD650, the first Compact Disc player to incorporate the new integrated circuits. **A**

Reference

Electronic Components and Materials, Vol. 6, No. 4 (1984), Philips N.V.

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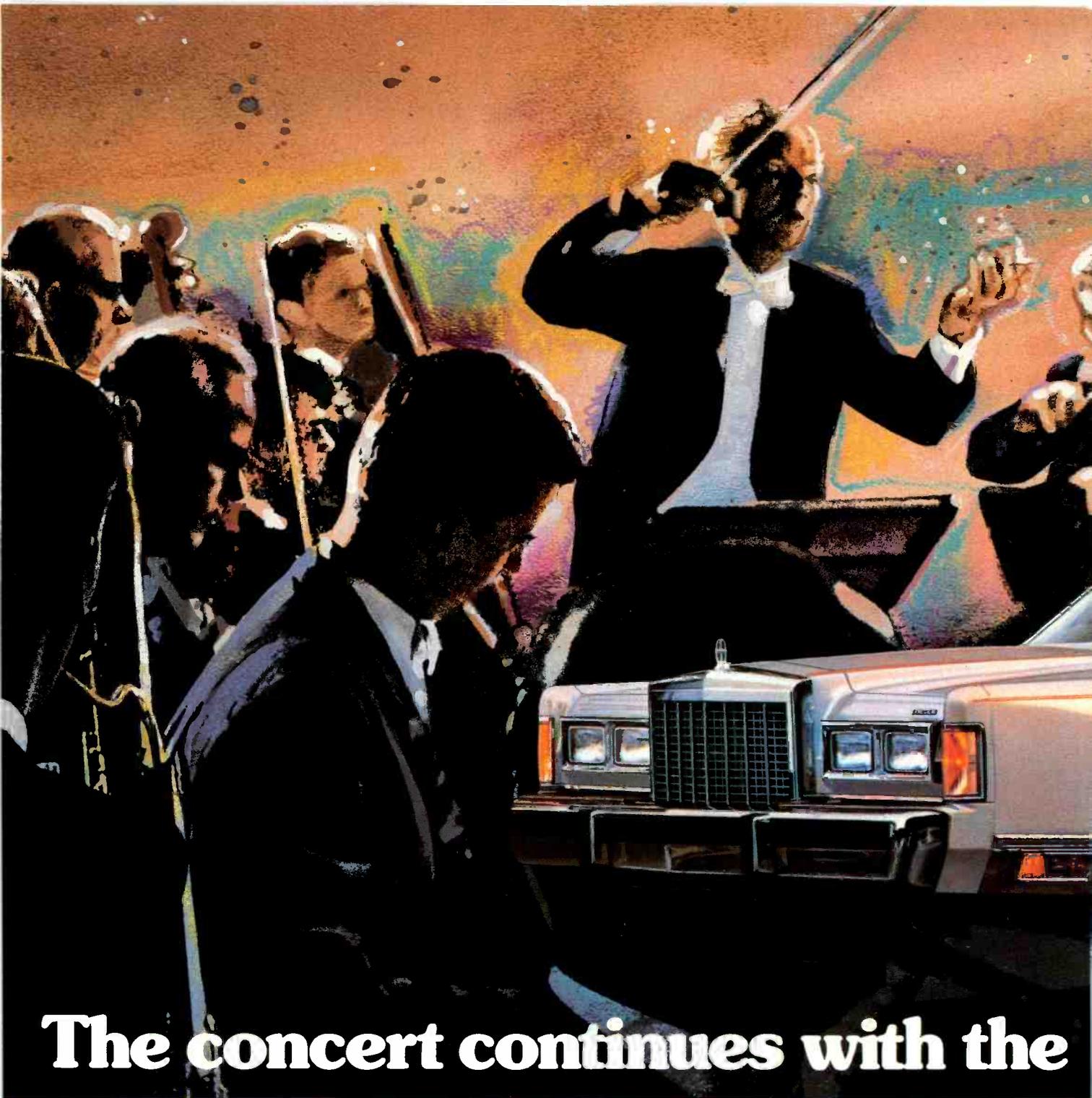
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AUDIO SYSTEMS

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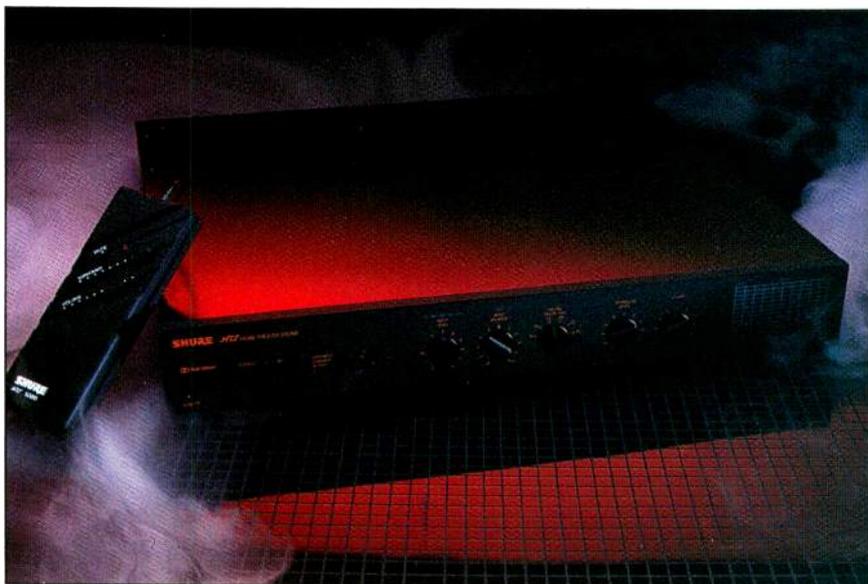
THEATRICKS

Last month, I began to tell you what I'd learned about Shure Brothers during a visit to their plant in Evanston, Ill. But there was too much going on there to discuss in one column, so here's more:

After the various Shure engineers had given me the grand tour of their facilities, I asked the company's president, Jim Kogen, how he was progressing with the diversification program he had told me about. He said that a logical step for Shure was to become involved with Compact Disc technology by introducing a CD player. Accordingly, Shure has procured an OEM player. It is modified to Shure's specifications and then is run through a special, dedicated quality-assurance program. Designated the D5000, the \$499 unit uses 16-bit linear quantization with 88.2-kHz, double oversampling and digital filtering. Its three-beam laser pickup is said to have a service life of over 7,000 hours.

Kogen noted that in the near future, much of Shure's technical resources will be utilized in the design and manufacture of a proprietary Compact Disc player. This will be a very advanced unit, embodying some quite innovative new designs.

Kogen told me that while the manufacturing of Compact Disc hardware will be an ongoing and important part of the company's future, the prime thrust of his diversification program is in the audio/video field. Shure's first A/V project was the responsibility of Bob Schulein, the current president of the Audio Engineering Society. Bob met us as we entered the Shure listening room, which was dominated by an 8-foot-diagonal TV projection screen. Mounted on the ceiling was a three-beam color video projector of Italian manufacture. The projection screen was flanked by large loudspeakers, with another speaker centrally located beneath it. Behind several rows of seats, a pair of loudspeakers were positioned at the left rear and right rear of the room. Off to one side was an equipment table, on which there was a videocassette recorder, a videodisc player, and the reason for all this array—the Shure HTS5000 Surround Audio Processor. Connected to the rear of the \$599 unit, although out of sight, were amplifiers to power the three front



The Shure HTS5000 Surround Audio Processor

loudspeakers, the rear loudspeakers, and a subwoofer.

Most people are aware that many movie theaters are equipped to show films that have Dolby Stereo soundtracks. The usual speaker layout in a theater differs slightly from that of the Shure listening room, in that multiple speakers are employed in a U-shaped configuration along the back sides and rear of a theater. Depending on the nature of the movie, spectacular special effects, particularly motional effects, can be heard from the theater's rear speakers to enhance the excitement and overall impact of the presentation. In essence, Dolby Stereo movie soundtracks have the stereophonic sound field and the rear directional, special-effects signals encoded in a 4-2-4 matrix.

There are currently more than 700 movie productions encoded with Dolby Stereo sound, and many of them also have the exciting surround-sound information. When a videocassette or videodisc of a Dolby Stereo movie is made, the encoded stereo and surround characteristics are transferred intact. Under normal TV playback from a VCR or videodisc player, the encoded stereo and surround signals are not reproduced; in fact, many people are not even aware of their existence. However, if the signals from a Dolby Stereo-encoded videocassette or vid-

eodisc are fed into a Dolby Surround decoder/processor such as the Shure HTS5000, and the requisite speaker array is available, the movie will have all the excitement and dynamics of the original Dolby Stereo theater presentation, including the rear-channel special effects.

It should be understood that when a movie is produced with Dolby Stereo sound, the mixing and encoding of the stereo and surround effects usually conform to specific standards developed by Dolby Laboratories. This ensures that the films will be properly decoded, with all of the special effects occurring at the proper times and places, when played through the Dolby Stereo theater installation. It is also true that videocassettes and videodiscs encoded with Dolby Stereo sound will not be properly heard if played through a decoder/processor which attempts to bypass some of the Dolby Stereo playback parameters. Minimally, a Dolby Surround decoder/processor should employ the Dolby Stereo matrix along with the Dolby B noise-reduction chip, and apply time delay to the rear-channel surround-sound information.

With the present boom in audio/video technology, Dolby Surround is a popular new concept, and the decoder/processors are expected to be very hot items in the marketplace. It should

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Besides the Dolby Stereo matrix, Dolby B NR, and digital time delay, the HTS5000 has some extras: A "space generator" and directional enhancement.

come as no surprise that even at this early stage, there are many standard processors which do not incorporate the essential elements for accurately decoding Dolby Stereo movies. Most of these pseudo-decoders are little more than opportunistic gadgets attempting to take advantage of a trend.

In contrast, the Shure HTS5000 Surround Audio Processor is the result of an extensive research program whose goal was the development of a unit which would decode Dolby Stereo movies on videocassettes and video-discs with the same accuracy and integrity of signal information as that provided by Dolby professional stereo decoders in theater installations. As I heard in Bob Schulein's demonstration of the HTS5000 decoder/processor, the Shure unit most decidedly satisfies this criterion.

Shure has lavished much attention on the circuit topology of the HTS5000. In addition to the vital Dolby Stereo matrix, Dolby B noise reduction, and digital time delay for surround-sound channels, Shure engineers have incorporated some unique features to enhance the decoding of the 4-2-4 matrix in this processor. One of these is called the Acra-Vector directional-enhancement circuit. A Shure engineer explained that "The unit incorporates

directional enhancement circuitry capable of accurately enhancing strongly predominant sounds from any encoded perimeter direction, and an adjustable, wide-dynamic-range digital delay for processing the surround-speaker signals. The surround-speaker time delay is needed to aid forward localization of less strongly predominant front sounds which do not receive directional enhancement."

Another clever circuit is the Acoustic Space Generator. Since there are only two rear surround speakers in a home installation, this circuit diffuses the rear image and discourages localization at the closer surround speaker. This simulates the rear U-shaped array of multiple speakers in Dolby Stereo theater installations.

While the HTS5000 can be operated with a minimum of two front and two surround speakers, the preferred configuration calls for left-, center-, and right-front loudspeakers, plus a subwoofer, as well as the two surround loudspeakers. The use of a center-front channel permits wider spacing of the left and right loudspeakers and furnishes a stable dialog channel. The subwoofer is necessary to properly reproduce heavy bass sounds such as explosions and thunder, as well as the grossly exaggerated low-frequency ef-

fects used by moviemakers to add drama and emotional impact to their films.

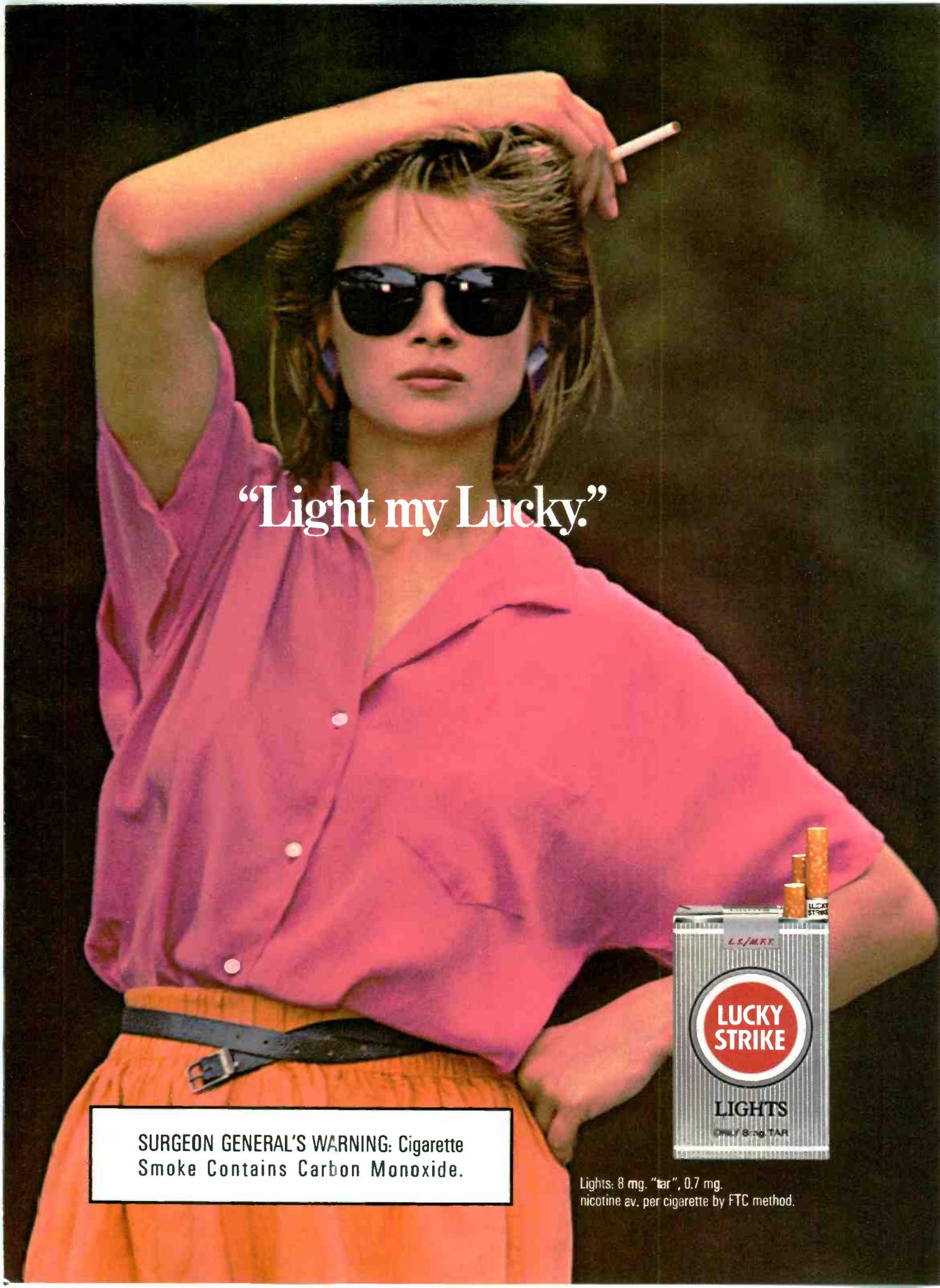
After I was thoroughly familiar with the functions of the HTS5000 and the configuration of a Dolby Stereo system, Bob Schulein turned down the lights and in a moment we were being dazzled by a great battle scene from *The Empire Strikes Back*. Spaceships screamed toward us, in back of us, over us; bolts from laser guns zipped by our ears, and great explosions shook our viscera. We were caught up in a multi-directional sonic maelstrom, and there was no question that the large projection screen heightened the illusion of participation. The whole effect was overwhelming. Dialog was crisp and clean, and the stereophonic music and special effects were reproduced by the system with stunning clarity and impact.

Of course, the sounds in *The Empire Strikes Back* and other space epics are largely contrived, studio-generated special effects. Fantasy sounds, if you will, which do not exist in the real world. Real-life sounds make surround-sound movies even more realistic. For example, when Bob demonstrated the opening scenes of *The Thing*, a helicopter seemed to fly all around us in the listening room. Bob also demonstrated scenes from *Raiders of the Lost Ark* and *Romancing the Stone*, in which the normal sounds of real life, heard in surround sound, heightened the sense of participation and realism.

Believe me, friends, once you have seen and heard a proper Dolby Stereo movie presentation in your own home, you'll never again be satisfied with ordinary, garden-variety television. Is a big-screen projection television necessary? There is no doubt it is a great advantage, but I have been using an HTS5000 decoder with a 25-inch color TV monitor and high-quality speakers and amplifiers, and I find it to be a most thrilling experience—as do most of my friends. A big advantage is use of a videodisc player which can handle true digital soundtracks. With such a high-quality medium for Dolby Stereo movies, plus audiophile-quality amplifiers and speakers in the playback system, you can actually achieve a much higher quality of sound than in most Dolby Stereo theater installations. **A**

Shure's D5000 CD player





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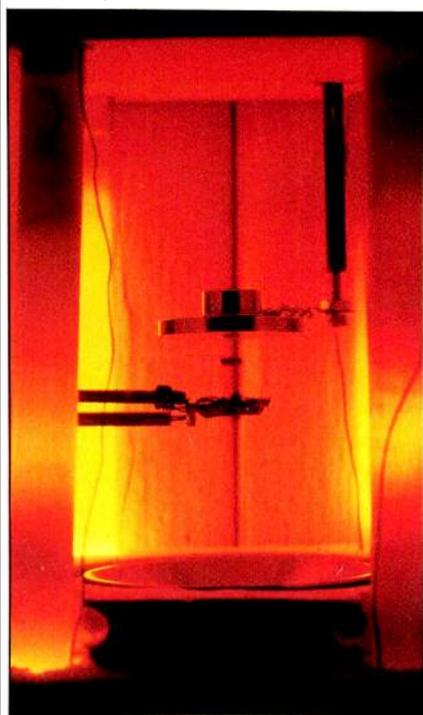
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RAISIN LEVELS



Sound Power

There are easier ways to lift a raisin than by floating it on sound waves. There's no reason on earth to do it—but there is one in space, where the Intersonics Sound Levitator, shown here, is used to hold materials without touching or possibly contaminating

them. Combined with a high-temperature furnace (2,800° F), the device can be used for making metallic glasses and other substances not possible or practical to make under normal gravity. The frequencies used are between 15 and 20 kHz. At 20 kHz, objects up to 0.2 inch across can be levitated; slightly larger objects can be lifted at 15 kHz because of its greater wavelength. The levitating wave is quite intense—more than 160 dB SPL. (It only takes about 10 dB more to ignite a cigarette by the friction of the moving air molecules.) Even so, the heaviest mass the system has yet levitated on earth is 1 gram—however, that was a gram of platinum, nearly twice as dense as lead.

An indirect result of Intersonics' space research is a new speaker design—not a tweeter, as you'd expect from their high-frequency work, but a new subwoofer. The Danley driver, named after engineer Thomas Danley, uses a low-inertia servomotor driving a rotary-to-linear converter, rather than the conventional magnet and voice-coil. It's made for sound-reinforcement work in concerts but may be available in home versions soon. (Intersonics is at 3453 Commercial Ave., Northbrook, Ill. 60062.)

Remote Mono

One of the nice things about being an editor of this magazine is being able to attend Luncheons of State. Yesterday's was with Larry Jaffe and Ken Burnett of Studer Revox. Larry had an interesting experience in New England recently, where a Revox dealer replaced a mono tube-type receiver with a very up-to-date solid-state stereo unit. Even though he has two speakers, the thrifty gentleman who bought the new piece of gear has not, however, converted to stereo. He listens to the receiver in mono mode and uses its balance control to switch between the speakers, which are kept in different rooms. "Eh-yuh, Marthie, this here stereo's just a fad. It'll go the way of them wax cylinders." *E. P.*



TweEQ

With all the current foofaraw over imaging, sound stage, rise-time, slewing, TIM and such, frequency response has become the forgotten parameter. Once we'd achieved the magic range of 20 to 20,000 Hz, and the major response differences among components of a given type were smoothed from mountains into foothills, we turned most of our attention elsewhere.

Yet subtle differences in frequency response do account for many of the audible differences among components—and some of the most easily perceived ones, at that. Bob Carver has now demonstrated this for two of the underground audio magazines, making one of his amplifiers sound virtually indistinguishable from another amp of

the magazine's choice. Other audio wizards have been able to perform similar feats.

So maybe it's time for a tweaking equalizer, or TweEQ: I envision a 31-band paragraphic—that is, a graphic equalizer with a slightly adjustable bandwidth and center frequency for each band—with a maximum control range of ± 2 dB instead of the usual ± 12 dB or so. It would *not* correct for gross problems in the system or the room's acoustics, nor would it be usable as a super tone control. But it would let you erase much of the sonic difference between the good components you already have and the slightly better ones you wish you could afford.

I suspect that the filters would be mild enough to cause few, if any, audible phase anomalies. Internal

filter controls could be used to tweak the TweEQ itself to perfect flatness in its neutral control positions. The controls should be knobs rather than sliders, to allow more precise adjustment, to permit the use of rotary-switched precision resistors instead of ordinary pots, and to distinguish the TweEQ visually from ordinary equalizers.

Would audiophiles buy this product? I suspect so. It would deal with the kind of subtle problems which now predominate in high-end systems. It would allow audiophiles to fiddle with equalization without breaking the Unwritten Law against tone controls. Its effects would be mild enough so that no amount of misadjustment could ruin the sound. And it would probably cost about a quarter of a mint.

The best audio investment in the world... Perreaux amplifiers have a built in 80% trade-in value.*

An interview with Anthony Federici,
Director of Perreaux International

Q. Why do Perreaux components have such a high trade-in value?

The trade-in value of Perreaux components have always been far higher than average. This is probably due to several factors: Engineering that is at the leading edge of technology... hand crafted, limited production... simple, elegant, non-trendy styling...

and exceptional value when new. To further increase trade-in value, Perreaux is now giving a one-year limited parts and labor warranty on pre-owned Series 2 that is traded toward Series 3.

Q. How long do you anticipate that Perreaux will retain this exceptional trade-in value?

Probably indefinitely, because the resale value is intrinsic to the product. Given Perreaux's reliability and longevity, a 1-year warranty on pre-owned equipment is not an expensive commitment for the

factory. In other words, the trade-in "deal" simply reflects the real world value of Perreaux. I would expect both new and used Perreaux's to continue to retain the world's highest trade-in value.

Q. Why do you believe people will pay as much or more for a used Perreaux as for a new product from another manufacturer?

Because they are already doing so with Perreaux. A used Porsche or Mercedes costs more than many

new cars. However, because essentially there are no mechanical parts, it won't deteriorate like a car.

Q. Will this lead the way for audio components other than Perreaux to increase their trade-in value?

I hope so. Because it will allow more people to enjoy quality audio. As an example: The new Perreaux Series 1 system, consisting of a tuner, preamp and power amp, retails for about \$2000. I would expect it to retain about a \$1500 trade-in

value toward a new Perreaux. This means that the consumer will have been enjoying Perreaux quality and performance for about \$500. That's only the cost of a moderate receiver.

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We usually decide at the last minute which product reviews will be in a given issue, basing our decision on newsworthiness and when the product came to us.



Ads Inifinitum

Suspicion of business is becoming ingrained in American thought. So we get occasional letters from readers who assume that, when the issue of *Audio* containing a product review also contains an ad for that product, then the fix is, somehow, in. In real life, it doesn't work that way.

To begin with, the reviewers don't know anything about what ads will appear, or when. The reviewers don't even know, most of the time, what issues their reviews will run in—we decide that only at the last minute, based on what reviews we have, and when the products originally came to us. Newsworthiness is a factor, too.

We editors don't know what ads will run in a given issue, either. We know about how many ads there will be—we must, to know how many pages of editorial material there will be room for. (The more ads to bring in money, the more editorial pages we can afford to run. Subscription money is a

small part of the equation.) Very late in the issue, we see a series of page-layout schedules which show what manufacturers are advertising (though not which products will be advertised) and whether those ads are black-and-white, two-color or four-color; and the ad makeup keeps changing, right down to press date.

For the most part, manufacturers themselves don't know what issues their products will be reviewed in. Neither, by and large, does our ad sales staff. So the simultaneous appearance of an ad and a review is usually coincidence.

In some instances, however, manufacturers do learn when their

review will appear, and schedule an ad to go along with it. This does not mean they know how the review will turn out (they don't see the reviewer's findings until the issue comes off the press), but they usually assume it will be favorable. Sometimes they assume this because they know how good their products are, sometimes because they optimistically *think* they know—but they never actually know what the review will say. (We do check with manufacturers on the specs and the purely descriptive portions of reviews in advance, but that's all.)

Our ad sales people try to discourage advertising a product in the same issue where it is reviewed, because it's not smart advertising. Advertisers gain more from distributing their product impressions over many issues than they do from bunching them all together into one. But if the advertiser insists, well, it's his money.

Discwasher® takes the tackies off your tape path.

Discwasher tape care products do away with tacky contaminants for the purest sound possible.

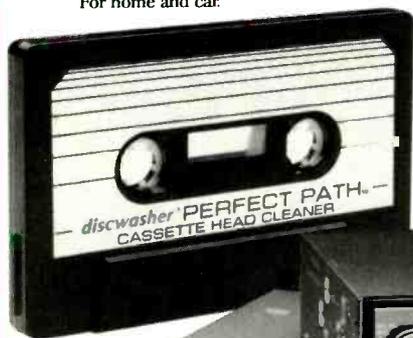
The Discwasher® Perfect Path™ Cassette Head Cleaner removes oxides and residues from all tape heads and the entire tape path. This unique dry cleaning system is gently effective and totally non-abrasive.

Discwasher® C.P.R.™ cleans capstans and pinch rollers to prevent

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Scientific Illusions

Reviewers of loudspeakers sometimes speak of black magic, the hidden ingredient that makes a speaker sing after science has had its say. For us at Infinity, there's no magic in designing a loudspeaker, though there is intuition, and art, and a lot of applied science. Yet we traffic in illusion and we bend our science to create the impalpable reality that occurs when a living performance emerges from our loudspeakers. This year the illusion becomes more potent through these product innovations:

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- A Series II automotive speaker line that offers all new drivers and cosmetics. New Polycell midranges and tweeters do wonders for the human voice and anything else within its frequency band.
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MUSIC ON THE MOVE:

The Keys To Car Stereo

IVAN BERGER and HANS FANTEL

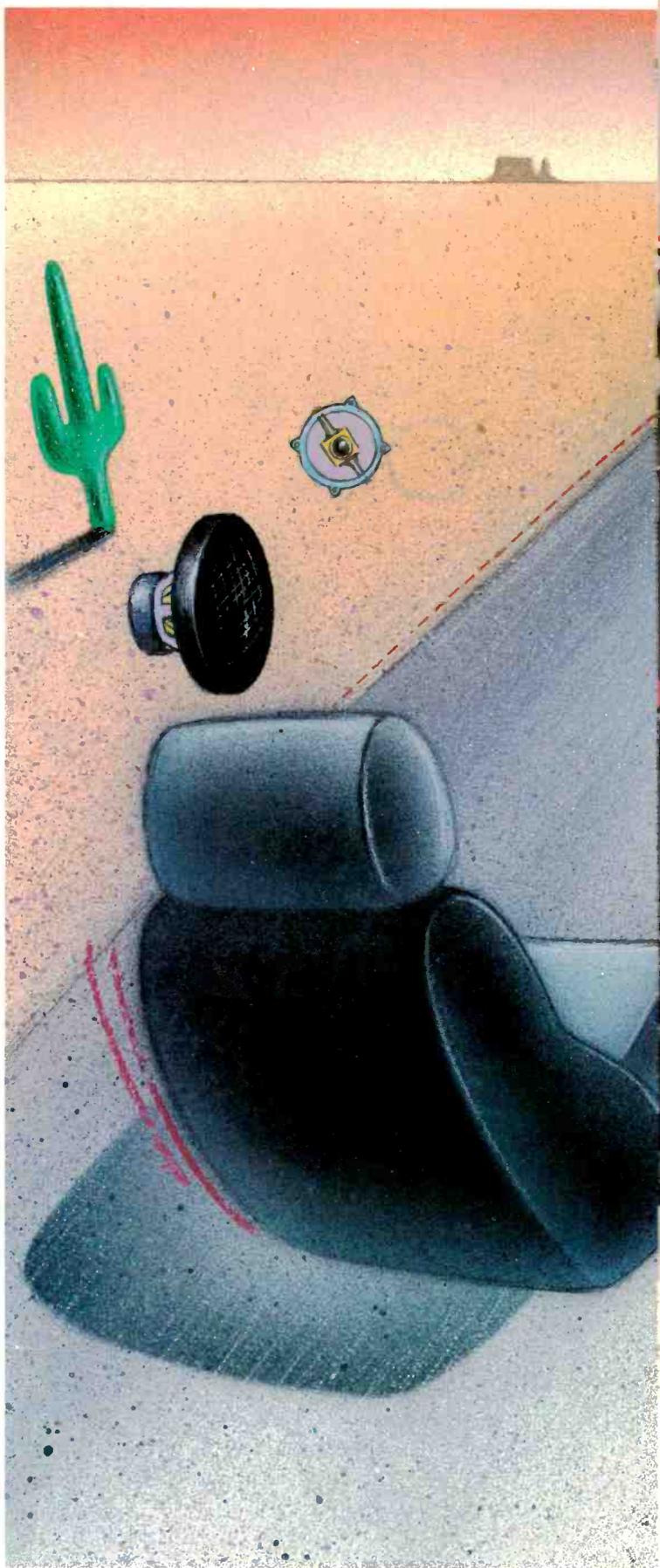
Car stereo is a mixture of the familiar and the unfamiliar. As in home stereo equipment, you can get all-in-one systems or build up systems from separate components, and manufacturers' specifications are available to give you some idea of how a system will perform. However, the mixture of components is different in car systems (for example, the tuner and tape deck are nearly always combined), some of the specs must be read with a critical (even skeptical) eye, and the car's spatial and acoustic limitations make installing a good system much trickier.

The systems made up of these components vary in complexity (Fig. 1). A typical, basic car sound system will consist of a single in-dash unit (variously called the receiver, head unit, or deck) combining a tuner, a cassette deck (for playback only; car decks rarely record), and an amplifier, plus a pair of speakers. Speakers are commonly mounted in the dashboard or front doors and in the parcel shelf, or rear deck, between the top of the back seat and the bottom of the rear window.

The amount of space available for the amplifier section of a basic system's head unit is limited, so those systems don't have much power on tap. To get more power, complex and advanced systems may include separate amplifiers (often larger than the entire head unit), and may include a frequency equalizer as well. Sometimes, the amplifier and equalizer are combined; if not, the amplifier is usually installed out of sight.

More expensive "super systems" will usually include a crossover and separate amplifier to power a subwoofer, and

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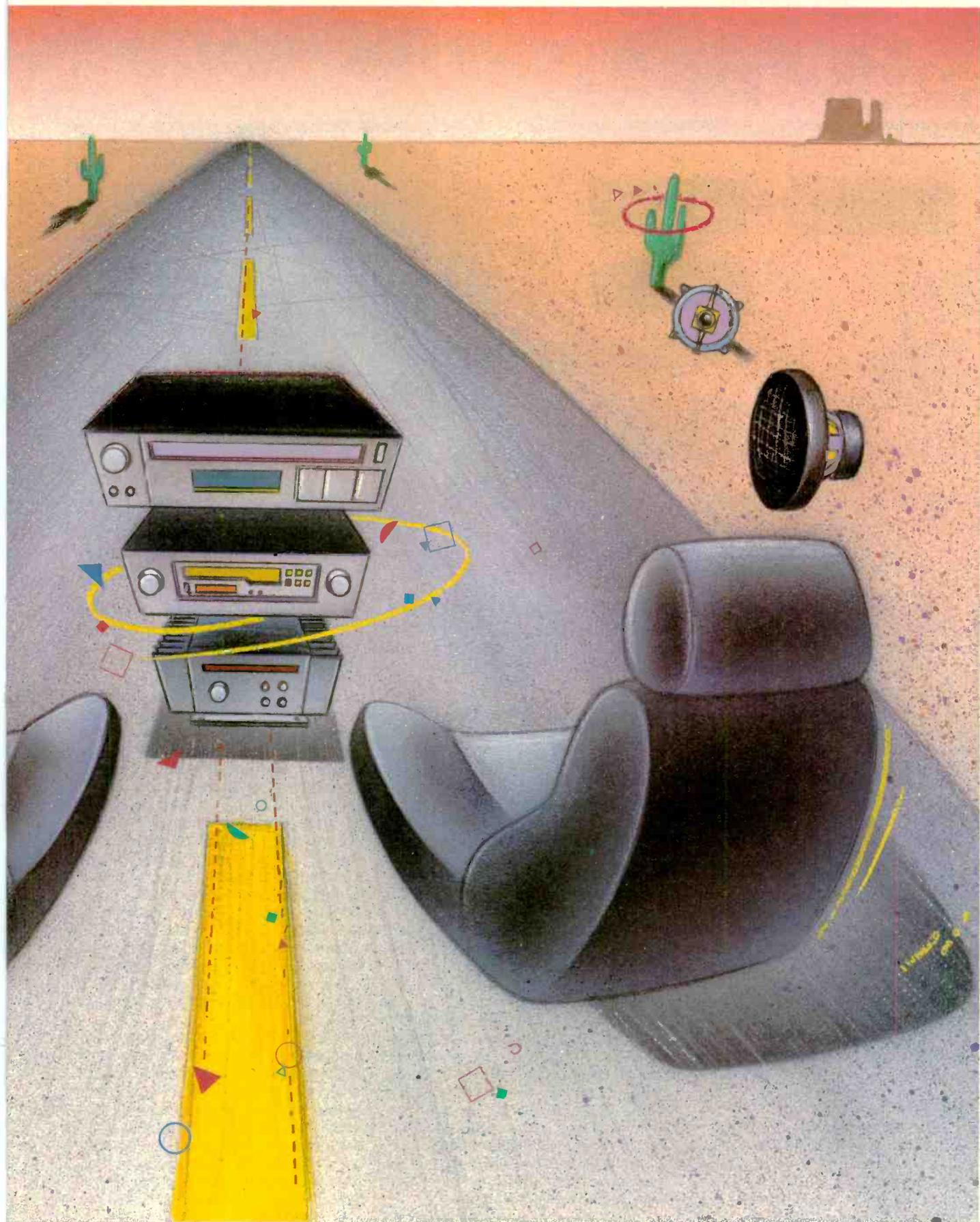


Illustration: Akio Matsuyoshi

Low-cost receivers usually have amplifiers built in. Deluxe models generally don't, on the assumption that they'll be used with separate, high-power amps.

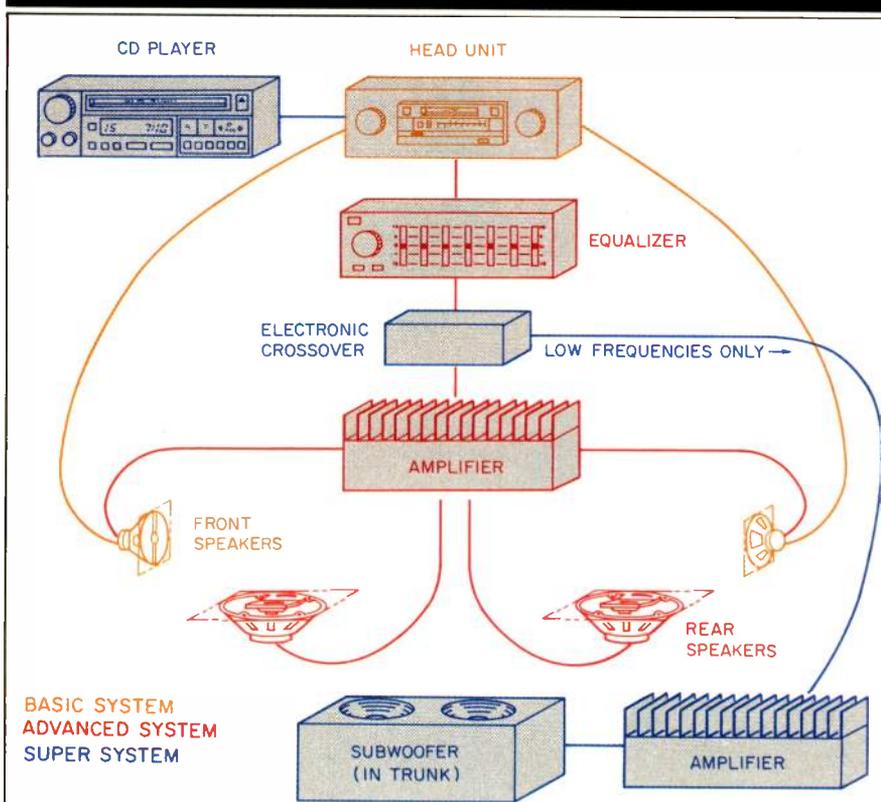


Fig. 1—In basic car-stereo systems, the head unit (tape and tuner sections) in the dashboard drives the speakers directly. In more advanced systems, separate amplifiers are used, allowing higher power output; equalizers may be separate (as shown), be combined with amplifiers,

or be omitted altogether. The most advanced super-systems add an electronic crossover to route the lowest frequencies away from the main amplifiers and speakers, and through a separate amplifier and subwoofer. CD players are also found in expensive systems.

may even include several crossovers and amplifiers to separately power each loudspeaker driver. Increasingly often, such systems will include a Compact Disc player in addition to, or instead of, the cassette deck. In advanced and super systems, the number and placement of speakers (other than subwoofers) will be pretty much the same as in a simple system, but those speakers will usually be of higher quality.

The Receiver

A car-stereo receiver must be selected with an eye toward the kind of system it will be used in. Lower cost receivers (roughly \$100 to \$350), designed for use in basic systems, have built-in amplifiers of fairly low power

(typically less than 5 watts per channel) so they can drive the speakers of such a system directly.

Many medium-priced units (typically \$200 to \$600) have both amplifier and preamp outputs. While they can be used without additional amplifiers, the extra outputs allow the system to be expanded with separate high-quality amps when the money is available. Few buyers, however, actually do expand their systems because of the difficulty of getting at components and wiring after installation. The most deluxe receivers (about \$500 and up) generally have no built-in amps at all, on the assumption that they will be used only in advanced or super systems with external amplifiers.

Control-panel design is far more crit-

ical in car than in home stereo receivers. The car receiver must cram all the controls of a typical home system into a front panel smaller than that of any single home component. At the same time, those controls must be easy for the driver to find and use, both day and night, while keeping his eyes on the road. To complicate the designer's life still further, no two users (or designers, for that matter) quite agree on what controls should be emphasized and on what design makes them easiest to use. Before buying a receiver, check its controls, preferably from about the same relative position as you'll occupy when driving, to make sure its design is convenient for you—not just for comfort, but for safety.

Because a car-stereo system must compress nearly all a home system's functions into such a tiny space, it may lack features you would miss. For example, many systems omit tape-equalization switching or noise reduction, which critical listeners will want. So make sure that your choice has all the features you need.

If it's simple to use, automation becomes a safety measure in the car; two common forms are scan tuning and seek tuning. Every time you press the seek control, the tuner advances to a new station, so you don't have to tune manually to find where the next station is. Scan tuning samples each station for 5 to 10 S, then moves on to the next; you stop the search when you hear something you'd like to keep listening to. On most sets, scan and seek work only in one direction, from lower to higher station frequencies; on a growing number, though, they work both ways, which is more convenient. Diversity tuning, another automatic feature, constantly compares the signals from two antennas, selecting as its signal source whichever is better at any instant.

Even more automation is usual in the tape section. There are equivalents of station seek (often called music search or any one of many similar names) and of scan tuning (called tape scan), both usually operating bidirectionally. Auto reverse is common, and systems without it frequently have auto repeat, which lets you repeat the same side of the tape over and over. It's even more important to have a system which dis-

Effects of noise reduction are audible even in a moving car, because road noise is mainly of low frequency, while NR fights high-frequency hiss.

engages the transport from the tape when it's done playing or when the car's ignition is turned off. Otherwise, the rubber pinch roller that holds the tape against the transport's capstan will develop flat spots, causing wow and flutter during subsequent tape play. One such system is key-off eject, which automatically ejects the tape; this not only protects the pinch roller but prevents you from leaving the tape in place when you park the car, thus eliminating the possibility that the tape will jam your stereo if it warps in the hot sun. Many recent decks have auto pause instead of auto eject. At shutoff, or when you press the pause button, this feature disengages the transport from the tape but leaves the tape in place. Therefore, you can restart the tape just by pushing the play button rather than having to push the cassette back in. This is a convenience—but it probably still pays to remove the tape entirely when parking in the sun.

Not all tape features affect tape motion. Some (especially tape equalization, noise reduction, and azimuth adjustment) affect the fidelity of the sound. The equalization selector, usually labelled "Metal/Normal," matches the playback to the 70- μ S equalization generally used with metal (Type IV) and chrome (Type II) tapes, or the 120- μ S equalization normally used with ferric (Type I) tapes. Some modern car players select the proper EQ automatically, by reading notches in the cassette which indicate the tape type.

Noise reduction is basically designed to combat tape hiss, a high-frequency noise; its effects are plainly audible, even in a moving car, because road noise is mainly of low frequency. Four types of noise reduction are common in car stereo (though usually not all four in any one unit): Dolby B, Dolby C, dbx, and DNR. The two Dolby systems and dbx are needed for optimum playback of tapes recorded with those NR systems; you'll want to have the same NR system in your car deck as you use when making tapes at home. Unlike the other three, DNR can be used on any tape (or radio broadcast, for that matter).

Dolby B NR, found on virtually every home cassette deck and used on most commercially duplicated cassettes, amplifies hissy high frequencies in re-

coding and reduces them by an equal amount in playback, simultaneously diminishing by up to 10 dB any high-frequency noise which may have been added to the original signal. If your car stereo lacks Dolby NR decoding, it can still play tapes made with Dolby B NR if you turn down the treble control. The frequency response will be slightly off, but the sound will still be passable.

Dolby C NR, whose popularity is growing rapidly, reduces high-frequency noise by up to 20 dB and reduces midrange noise as well. But tapes made with Dolby C NR *must* be played back on decks with Dolby C decoders. Otherwise, they will sound shrill. Similarly, if you make tapes with the dbx noise-reduction system, then you must play them back through a head unit which has dbx decoding (which quite a few car-stereo units have), or the tapes will sound unpleasantly compressed and a bit shrill.

The DNR system consists of a high-frequency cutoff filter whose action varies with the high-frequency content of the playback signal. When the signal's high frequencies are strong enough to override noise, the DNR filter opens up to let those highs through. When the signal's high frequencies are weak enough for noise to become audible, the DNR filter clamps down to cut off the high-frequency noise. The DNR system can be used in conjunction with other noise-reduction circuits.

A small but growing number of car-stereo units now correct or compensate for azimuth errors. When the playback head scans a tape at a different azimuth angle than the recording head did, the mismatch causes high-frequency losses. This problem is especially common in car-stereo units because they only play tapes recorded on other machines, which increases the probability of mismatch. Also, a given tape's effective azimuth will change according to its direction relative to the cassette shell; therefore, the many car stereos with automatic tape reverse face different azimuth angles for each direction of play. And the bouncing and vibration which mobile equipment is subject to can shift the heads slightly, making azimuth problems likely to increase over time.

Several car-stereo units compensate by adjusting the playback head's an-

gle. In most cases, the adjustment is preset to compensate for the difference in azimuth between forward and reverse playing directions. A few models can be manually adjusted, by ear, to compensate for any azimuth error (even errors due to misaligned recorders), and at least one model corrects its azimuth automatically, while the tape is playing. Another approach is to leave the playback head alone but boost the high-frequency response enough to compensate for azimuth losses; this too must be set by ear.

With two possible exceptions, specifications mean exactly the same thing when applied to car-stereo components that they would mean if applied



A



B

Stereo units with knobs at each end and the tape slot and tuning indicator jutting from the middle (A) fit the dashboard spaces in most older cars and many newer ones. The dashboard spaces in more and more new cars, however, are rectangular, DIN-standard slots for which flat-front units (B) are designed. Note the station indicators: Pointer-and-dial (A) vs. digital readout (B). The digital display panel of the unit shown here flips down for access to the cassette slot and subsidiary controls.



Equalizers with up to seven bands are still simple enough to be used as extra-versatile tone controls.

Equalizers are more common in cars than home systems. In theory, they're there to fix sonic problems, but many use them simply as tone controls.



Complex equalizers should be set up by a competent installer, preferably with the aid of test instruments, and then left alone. Such equalizers are often mounted in the trunk to discourage fiddling.

to home equipment. The two exceptions, power and tuner sensitivity, may or may not mean the same as they do in home-component spec sheets, depending on how they're stated.

When you see a car-stereo amplifier's power specification given in full, e.g., "20 watts per channel, from 50 Hz to 18 kHz, at 0.5% distortion," you can assume it means the same thing that the same spec would for a home amp. The only difference is that the car amplifier's rating will be given in terms of the power it can deliver into 4-ohm speakers, rather than the 8-ohm loads used in rating home amps—quite legitimate, as almost all car speakers have 4-ohm impedances.

However, be skeptical when *any* of those details are omitted from the specs. If no power bandwidth is listed, assume the power rating applies only at 1 kHz, with somewhat less available at the ends of the audio frequency band. If no distortion figure is specified, assume that the power is measured at an unlistenable high 10% distortion. And if the spec does not list power "per channel," assume that the figure given is for the sum of all the channels, not just for a single channel. That can be especially deceptive if, as is often the case in car systems, the amplifier has four channels instead of the usual two—not for quadraphonic use, but to power the front and rear speaker systems independently. Without *all* of these formal technical specifications, the 20-watt amplifier described above could be listed as delivering 120 watts or more!

Tuner sensitivity figures in dBf mean the same thing in car and home tuners, but sensitivity figures in μV are *not* equivalent, due to different antenna impedances. Thus, a sensitivity figure of 20 dBf would be given as 2.75 μV if measured across a car tuner's 75-ohm input but 5.5 μV if measured across a 300-ohm input, as is commonly done for home tuners.

EQs, Amps, and Crossovers

Equalizers are more common in cars than in home systems. In theory, they're being used to overcome the sonic problems of the car's interior and the limitations of car speakers and speaker placement—tasks the usual five-band car equalizer, with controls for both channels ganged together, is ill-equipped to handle. In practice, all too many listeners simply set the top and bottom controls full up, so they'll always hear bass and treble even if they seldom hear what the music really sounds like.

If your system needs equalization to sound true, then you should probably rework that system, if you can afford it, until equalization is no longer necessary. Equalization can help, but only about as much as aspirin helps a broken leg. Any equalizer with enough flexibility to deal with your system's problems would have more controls than you could cope with while driving; elaborate equalizers which can handle such problems are usually designed to be set up by professional installers and then hidden away.

If you want to use an equalizer as a tone control, the fewer controls the better. This is one reason why five-band equalizers are the most popular type for car use. However, we find that a three-band equalizer is even easier to use and is still as versatile as one could wish.

Amplifiers come in two types, power amplifiers and boosters. The main difference is that power amplifiers are built to work from the weak, preamp-level output signals of the more expensive head units, while boosters require the heftier outputs of the small amplifiers built into lower priced receivers.

Boosters are basically designed for after-the-fact expansion of basic systems. The power increase available from boosters is often limited but is still

significant; the chief problem is that the booster also amplifies whatever noise and distortion may have been added to the signal by the receiver's amplifier stage. Some power amplifiers include both booster-level and preamp-level inputs; you can use such an amp to expand a simple system now, then reuse it later as the nucleus of a more advanced, higher powered system.

Electronic crossovers route bass and treble frequencies to different amplifiers. They are far more common in cars than in home systems, and are often built into equalizers or amplifiers. Bi-amplifying—using separate amps for bass and treble—allows the use of a powerful amplifier for the bass, which needs it, and a less powerful amp for the more delicate midrange and tweeter drivers, which could be damaged by too much power. It also ensures cleaner sound; if the woofer amp is overdriven, its distortion will be confined to the woofer, which can't reproduce the higher and more annoying distortion products.

Since the correct crossover frequency to use depends on the particular speakers (and, to a slight extent, on the acoustics of the particular car), most electronic crossovers allow this frequency to be adjusted during instal-



Most car speakers are flush-mounted in holes cut into the car's interior panels. Since oval speakers are usually mounted in the shelf behind the back seat, some models (such as the Coustic HS-892, shown here) tilt the tweeter up to aim it more directly at the listener.

While most home speakers are built into enclosures, car speakers are usually naked drivers that must be flush-mounted in the car's body panels.

lation. Some even allow the low-pass frequency for the subwoofer and the high-pass frequency for the rest of the system to be adjusted independently.

In complex car systems, the amplifiers and crossover are frequently mounted on an amp rack in the trunk or elsewhere. This usually simplifies wiring and service, while giving the owner visible evidence of what he has when he feels like showing off. It can also make the components more visible to any thieves who happen by when the trunk is opened; for this reason, some installers conceal their amp racks behind removable panels.

Speakers

Choosing speakers for a car is far different from choosing them for home use. Most home speakers are built into enclosures when you buy them. Because space is so limited in a car, speakers must usually be flush-mounted in doors or other body panels. Therefore, most car speakers are naked drivers, without enclosures of their own. To conserve space, such speakers are usually coaxial types, with the tweeter mounted in front of the woofer. Systems with independently mounted tweeters and woofers, however, sometimes allow more choice of placement, with the woofers mounted where they'll fit and the tweeters where they can face listeners most directly. The woofer and tweeter should be within a few inches of each other for most natural sound; a speaker whose woofer and tweeter are mounted on a flat plate will ensure this.

Self-enclosed mini-speakers, sometimes mounted on rear decks or slung beneath dashboards, can be used where it's inadvisable to cut large speaker holes. They also solve a problem for the speaker designer, who never knows for sure what enclosure volume will be behind his flush-mounted speakers; with self-enclosed speakers, he can optimize the design for a known enclosure volume.

Speakers should be placed and aimed so that passengers can hear the more directional high frequencies; treble is lost if the highs are aimed at the car's upholstery or the passengers' socks. This is often easier said than done, however. It helps to have both front and rear speakers so that sound

When woofers and tweeters are mounted independently, the installer can put the woofer where there's room for its large magnet and mount the tweeter where its highs can best be heard. Next to the speakers is a crossover network which routes highs to the tweeters and lows to the woofers.



can reach front and rear passengers at equal levels. (Fader controls on receivers and equalizers are used to adjust the front/rear balance.) Otherwise, the passengers farthest from the speakers will hear clearly only when the sound is loud enough to curdle the ears of passengers closest to the speakers. Rear-deck speakers usually have an easier time delivering deep bass than front-mounted ones, because larger speaker drivers can be located on the deck and because deck-mounted speakers can use the trunk's large volume as an enclosure. However, front-mounted speakers usually give a more natural impression, since we usually face music we're listening to.

The best values in car speakers tend to be two-way (woofer/tweeter) or three-way (woofer/midrange/tweeter) systems. Four-way, five-way, and other systems tend to raise cost more than quality, while single-driver systems tend to have limited, poorly directed frequency response.

The car's space limitations make it hard to fit speakers that are large enough to deliver good bass into loca-

tions where their upper frequencies can be heard. So, to get low bass in the car, it's easiest to delegate low frequencies to subwoofers, which can be tucked into the trunk or elsewhere. With such a setup, the low bass will be coming from behind the listeners, while most other frequencies will come from in front of them. The lower the frequency at which the sound crosses over from the main speakers to the subwoofer, the less you'll notice this; the subwoofer's location becomes least obtrusive when the crossover frequency is below 100 Hz. On the other hand, the higher the crossover frequency, the smaller the main speakers can be, which makes them easier to place. Still, in no case should the crossover frequency for a rear-mounted subwoofer be above 250 Hz. Some manufacturers offer components with built-in crossovers at about 2 kHz, well into the midrange. A 2-kHz crossover is acceptable when the tweeter and woofer are close together. But with front tweeters and rear woofers, the musical effect is like having your soup in front of you and your spoon behind.

You can install your own car stereo, but it's not a simple task. Many do it once or twice, then leave it to pros—and we speak from experience here.



Plate speakers such as these require the cutting of only one hole in the car body panel for the woofer magnet. The tweeter mounts in front of the body panel, not in it.

Car interiors tend to resonate at about 150 Hz, making the upper bass too prominent. Installers frequently stagger their crossover frequencies in order to leave a response dip between the subwoofer and upper-frequency speakers, thereby underemphasizing the frequencies that the car's acoustics will overemphasize. This only works, however, if the frequency at which the dip is needed is the right crossover frequency for the speaker drivers involved. If not, it's better to correct the car's acoustical problems with equalization.

Installation

Installation is usually best done by professionals. The car is a cramped and awkward place to work, and the

tools required are not found in most home workshops. Also, it takes a good deal of knowledge to place speakers where they'll sound right and where they won't interfere with window cranks and other mechanisms, and to install the electronics so they won't pick up noise from the car's electrical system. That's not to say you can't install your own system, especially if it's a simple one. Many people do—but most of them do it only once or twice, and then leave it to professionals thereafter. (We speak from experience here.)

It takes research to find the best installers in your area. Go by their reputation, by the sound quality and craftsmanship of the installations they've already done, and by their understanding of your needs. Make sure, too, that you and your installer know exactly what results you want and how they're to be achieved, and get a fairly firm estimate of what the installation will cost you.

If you plan to buy equipment yourself and then take it to an installer, make sure he'll go along with that. Many installers won't touch equipment that they're not familiar with, and quite a few won't install equipment that they didn't sell. For a complex system, it might pay to choose your installer first and work with him to pick a system, rather than picking the system and hunting for someone to install it.

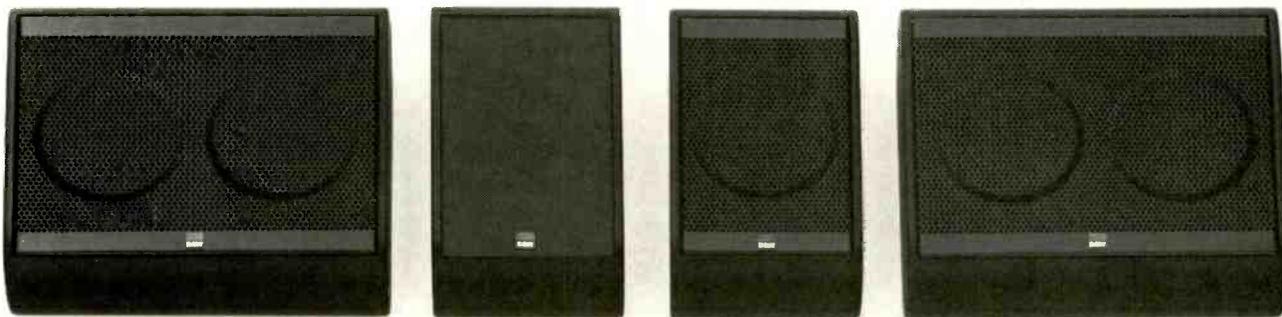
If you're buying a new car, check the sound systems offered by the factory. Since the success of the Delco-GM/Bose system ("Roadsigns," *Audio*, De-

cember 1982), some car manufacturers have moved towards producing premium sound systems of their own; the first of these we've heard, the Ford JBL system ("Roadsigns," *Audio*, November 1985), is at least as good. If you're considering a factory-installed system, make sure you hear a demonstration before buying, preferably in the same model and body style as the car you're ordering.

Car-stereo prices may seem high, at first. But while \$500 or more for one little box and a couple of speakers may strike you as costly, it may seem more reasonable when you itemize what you've bought as an AM/FM tuner, amplifier, cassette deck, speakers, and a custom installation. More elaborate systems, of course, cost more: \$1,000 to \$2,000 for a system is not unheard of, and we've heard systems up to \$5,000 or so that were worth the money—at least to those who had it to spend. As usual, diminishing returns set in at some point, where every cost increase brings less sonic benefit than the preceding one. Some of that cost may go for cosmetics (such as concealing equipment), and some may go for alarms and other security measures. In very high-priced systems, a lot of money may go for mindless multiplication of components; the phrase "16 speakers per channel" sounds far more impressive than the resulting system does! How good a system you're willing to buy will depend on your tastes, your income, and the amount of time you spend in your car. **A**

In this modular B & W system, the woofers mount in the trunk, feeding bass through hoses to the large grilles shown. The tweeter module, with its smaller grille, can be

surface-mounted on a body panel or flush-mounted in a hole cut into the panel. The small module without grille is a crossover, which can be concealed.



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FMX:

Long Distance Stereo, Clean as Mono

LEONARD FELDMAN

How often in the last month have you felt like switching your FM tuner or receiver from stereo to mono reception because the noise and distortion accompanying the desired program were intolerable? If, like me, you crave good FM reception, you've probably been frustrated more than once by the seriously degraded signal quality of stereo FM compared to mono reception. In fringe-area listening locations, the difference in signal-to-noise ratio between a station's mono and stereo signals can be as great as 23 dB!

If you've been troubled by this disparity between mono and stereo reception, imagine how the broadcaster feels. An FM station's potential audience for stereo may be only one-third to one-fourth as great as it is for mono. Of course, when you are bothered by noisy stereo reception, you usually have the option of switching over to mono—but if you are like me, more often than not you will simply tune to another station that's closer, for quieter stereo.

In 1961, when the FCC approved the present system for stereo FM broadcasting, they were well aware of that system's signal-to-noise degradation. At that time, however, they seemed more interested in preserving existing reception quality for the mono listener

than in safeguarding the stereo listener's interests. (Of course, there were no stereo listeners at the time.) An alternate system that might have provided virtually no signal-to-noise degradation in stereo would have introduced an S/N loss of around 6 dB for some mono listeners, so the FCC chose to favor the 17 million or so owners of mono FM radios. The millions who subsequently purchased stereo FM sets (whether for car, home, or portable use) have been suffering ever since.

Making Stereo as Quiet as Mono

A system of stereo FM transmission, dubbed FMX, developed jointly by Emil Torick of the CBS Technology Center and Tom Keller of the National Association of Broadcasters (NAB), could well rectify this situation if adopted by FM stations around the country. What makes the system particularly attractive is that it is completely compatible with existing FM radios and tuners. Owners of such equipment would continue to get the same kind of stereo (or mono) FM that they've been getting. Purchasers of new, specially designed tuners or receivers, on the other hand, would enjoy noise-free reception even of stereo stations that were previously too noisy to listen to without switching to mono.

Another nice thing about the FMX system is that FM stations can adopt it

If you ever wished that someone would improve FM stereo broadcasting so that it would carry over long distances and furnish the quiet background of mono, take heart! This new system provides both.

without requesting the FCC's approval. That's because the FCC has liberalized its rules regarding the use of subcarriers by FM stations. Since the FMX system involves the use of subcarriers within the frequency baseband authorized by the FCC, stations could begin using the system at once. Public radio station WPKT-FM in Meriden, Connecticut has been using the new system experimentally for some time, and field



FMX

FMX is particularly attractive because it is totally compatible with existing tuners. And no approval is required from the FCC either.

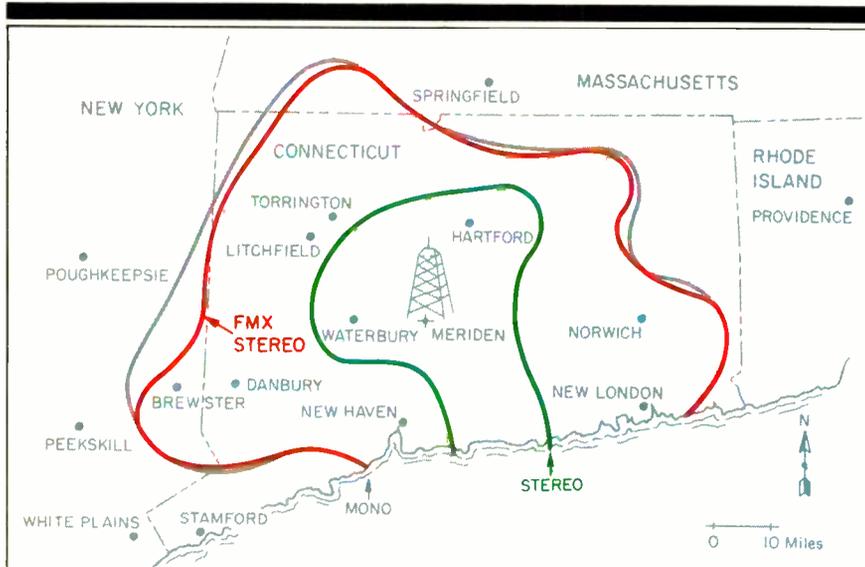


Fig. 1—Reception contours for a station using FMX, showing distance limits at which tuners could achieve 60-dB S/N in mono, FMX stereo, and conventional stereo. Note that quiet stereo reception with FMX extends nearly as far as quiet mono reception.

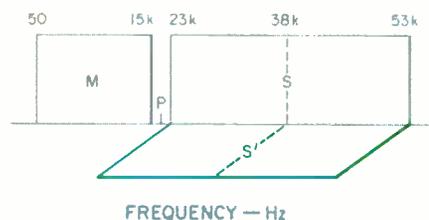


Fig. 2—The FMX composite signal, showing conventional mono sum (M) and stereo difference (S) components, plus the new FMX sideband (S') 90° out of phase with the other components. Note the pilot signal (P) at 19 kHz.

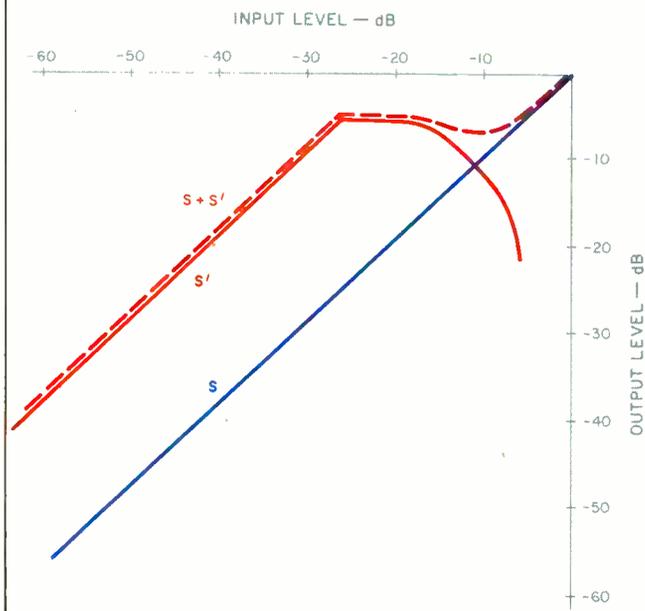


Fig. 3—Characteristics of the re-entrant compressor used for FMX transmission.

tests show that this station's effective stereo coverage using FMX has increased to just about the same as its mono coverage (Fig. 1).

How FMX Works

Figure 2 shows the baseband format of the new composite signal which modulates the station's carrier. The portions of this signal which are upright in the figure are identical to those of standard, non-FMX stereo FM transmissions. A monophonic, left-plus-right (L + R) sum signal, labelled M in the diagram, extends from 50 Hz to 15 kHz. Above it is a subcarrier signal, labelled S, consisting of sidebands extending 15 kHz above and below the subcarrier center frequency of 38 kHz. The sidebands are due to modulation by the L - R difference signal; the subcarrier itself is suppressed, but a 19-kHz pilot signal (labelled P) is used by the receiver to re-create the 38-kHz subcarrier and to trigger a tuner's or receiver's "Stereo" light.

The FMX system leaves the standard pilot, sum, and difference-modulated subcarrier signals unaltered but adds a second, difference-modulated subcarrier (labelled S') in quadrature (i.e., 90° out of phase) with the first subcarrier. Thus displaced in phase, it will not be detected by ordinary FM receivers or tuners.

The second subcarrier (S') is part of a companding noise-reduction system. Most of the noise that is so bothersome when we listen to stereo FM comes from the recovered difference (L - R) signal, not from the main-channel signal. So, if there were some way to introduce an effective companding or noise-reduction technique to this difference signal, the overall signal-to-noise ratio of received stereo FM could be significantly improved. In companding noise-reduction systems, a compressor boosts low-level signals to get them up and over the transmission or recording medium's inherent noise. At the receiving end, the program is restored to its original dynamic range by an expander, which lowers those previously boosted levels and thus lowers the medium's background noise as well.

There is an almost limitless number of ways in which companding can be accomplished for audio applications.

Dolby B noise reduction, for example, compresses and expands only high frequencies, since that's where tape hiss is most audible. Dolby C NR extends this action down to somewhat lower frequencies, and also uses more compression and expansion than Dolby B. Both Dolby NR systems work only on low-level signals, leaving high-level signals unaltered, and are therefore referred to as nonlinear companding systems.

The dbx noise-reduction system, on the other hand, compands all audio frequencies, and compresses all signal levels linearly, by a factor of 2:1. That is, every 2 dB of level change in an audio signal is compressed to a 1-dB change before it is recorded onto tape. During playback, dbx NR expands all frequencies, so that a 1-dB change in the level of the playback signal is expanded to a 2-dB change in output.

The compression technique chosen for the FMX system has several unique aspects. It is called a re-entrant compression system because it has a threshold above which no action takes place. It is configured to keep the sum of the S and compressed S' signals from overmodulating the transmitter at high signal levels, and to provide optimum channel loading or utilization at mid-levels with a compression slope that's close to infinite.

Figure 3 shows the response of the compressor S' (upper solid line), the uncompressed S channel (lower solid line), and the combination of the two signals (dashed line), which represents the total subcarrier burden imposed on the main carrier. At low signal levels, the compressor acts like a simple gain stage, raising the level of the S' signal about 20 dB above that of the uncompressed (S) subchannel. At medium input levels, the compression characteristic actually exhibits a slightly negative slope, and at still higher levels it becomes a rapidly changing negative slope. Figure 4 is a block diagram which illustrates the basic concept of the transmission system.

An Adaptive Expander

Though this type of compression system can be shown to make the most of available transmitter power and modulation characteristics, such

Fig. 4—Block diagram of the FMX transmission system.

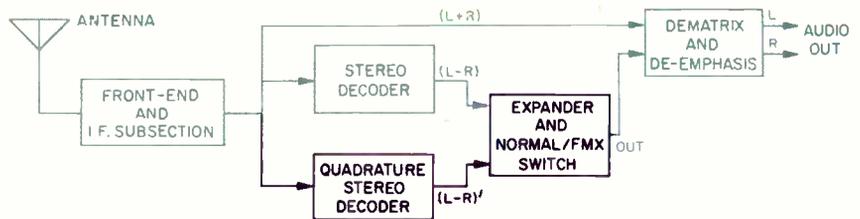
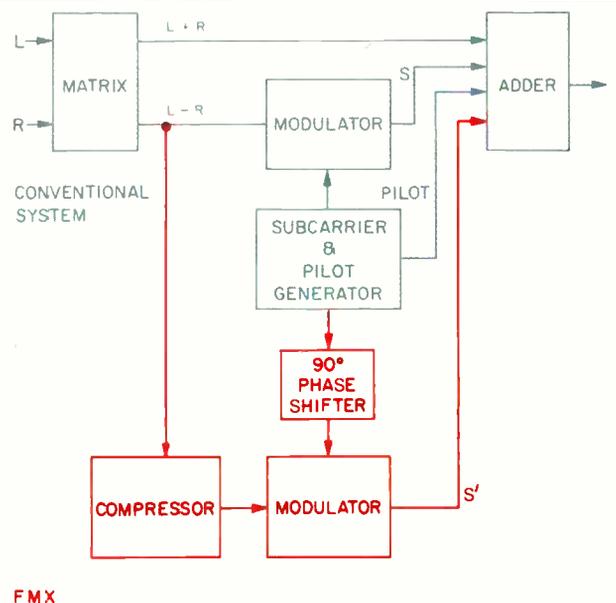


Fig. 5—Block diagram of an FMX receiver.

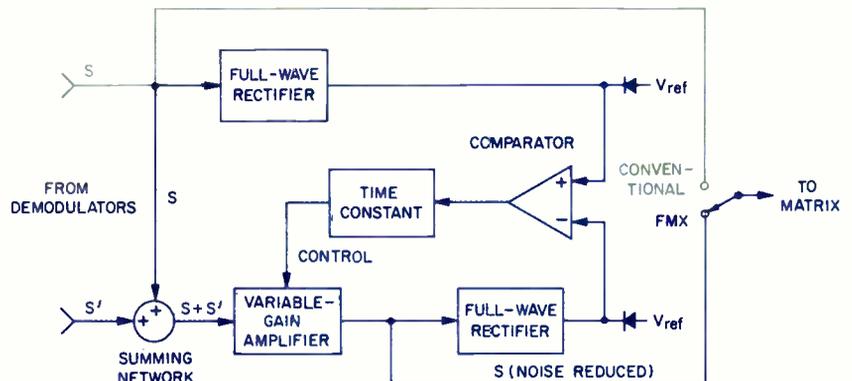


Fig. 6—Block diagram of an adaptive expander section for an FMX tuner.

Mid-band separation of 60 dB has been achieved by FMX, a figure which even conventional FM tuners can rarely attain.

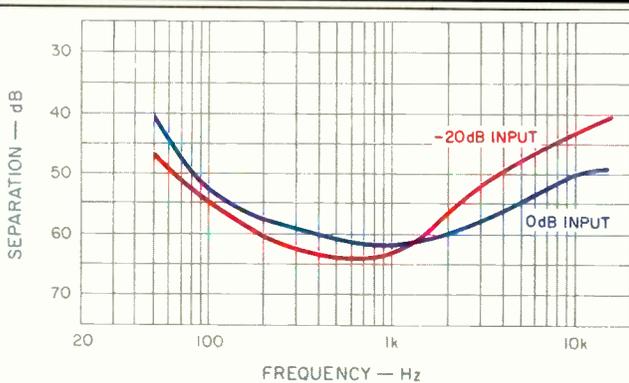


Fig. 7—Separation measured by the CBS Technology Center for an FMX decoder shows high mid-band separation at two signal levels.

compression cannot be decoded by a traditional expander having fixed slopes or expansion ratios. Perhaps the cleverest scheme of the entire system is the one used to re-expand the compressed L - R information.

Figure 5 is a block diagram of an FM tuner equipped to receive and decode the new FMX transmissions. A selector switch is included so that a listener may choose either companded FMX or conventional stereo FM reception. Note that even in its FMX mode, the tuner also detects the standard, conventional subcarrier. This subcarrier may include undesirably high levels of background noise, but its audio program content accurately conveys the instantaneous amplitudes of the L - R signal. So, while we don't want to *listen* to the audio information carried by this noisy subcarrier, the expander circuit can use that audio information as a *reference* signal—one that will provide the information the expander needs to restore the audio retrieved from the new quadrature-related S' subcarrier to precisely the same correct levels. This is important because the restored L - R amplitudes must correspond exactly to what they were in the original program, or else incorrect de-matrixing of the L + R and L - R signals will take place. That, in turn, would reduce stereo separation severely.

Figure 6 shows one possible arrangement for an adaptive expander. The conventional difference signal (S) is rectified and applied to one input of a comparator circuit. This signal acts as the reference signal in a feedback path. The compressed difference signal (S') is fed to a voltage-controlled, variable-gain amplifier whose output is

detected in a rectifier and applied to the other input of the comparator stage. The comparator's output, smoothed by appropriate attack and release time-constant circuits, is used to regulate the voltage-controlled, variable-gain amplifier's gain.

Whenever a difference exists between the level of the expanded signal and the unmodified S signal, the comparator will produce a control signal which causes the gain of the voltage-controlled, variable-gain amplifier to change until the comparator's output voltage approaches zero. As a result, the magnitude of the compressed difference signal becomes virtually equal to the level of the conventional difference signal. In this way, the expanded signal "tracks" the conventional signal and is totally independent of the absolute value of the compressed signal.

Figure 7 illustrates the separation measured by the engineers at the CBS Technology Center for an actual decoder using this adaptive expander approach. Notice that mid-band separation figures as high as 60 dB were measured in these closed-circuit tests. Even conventional decoders of regular FM stereo rarely are able to achieve such high stereo separation.

One additional refinement has been added to the FMX system recently. That is a low-level, sub-audible 10-Hz signal which is transmitted along with the quadrature subcarrier signal (S'). This additional signal provides switching information for FMX receivers and tuners, and may possibly also be used as an indicator-light cue so that listeners know when a station is, in fact, using the FMX transmission system.

Listeners to the station (WPKT)

which has been testing FMX are evidently not aware that anything is different. There have been no complaints about any change in signal quality of the conventional FM or stereo FM transmissions.

The idea of companding as a means of reducing noise generated by a transmission system had not even been thought of when the FCC first authorized stereo FM back in the early 1960s. Twenty years later, when the TV industry was considering different systems for stereo TV sound, the need for companding was realized almost immediately. The system selected for stereo TV includes a companding approach (in this case, one developed by dbx). CBS was also a proponent of a companding system for stereo TV. The FMX idea grew out of that technically related effort.

Since the CBS Technology Center introduced FMX at a professional engineering conference, many FM broadcasters have expressed interest. One manufacturer, NAD, has shown a prototype of a tuner using discrete-component FMX circuitry. But even before that, some IC manufacturers had shown an interest in tooling up to produce FMX decoder chips. As with all such new inventions, there is always the question of who is going to make the first move. In order to interest FM stations in the idea, assurances must be given that there will be receivers out there to pick up the improved FM stereo signal. And in order to interest receiver manufacturers in building components with FMX decoding capability, there has to be a promise of IC availability so that costs of hardware implementation don't become particularly excessive.

One thing you can do to help spread the use of the new FM system is to make your favorite FM stations aware of its existence. Once they know there is a way to triple or quadruple their useful stereo listening area, they'll probably be eager to learn more about the system. You can refer them to this article or, better still, have them call the CBS Technology Center in Stamford, Connecticut. In case you are an FM station engineer or manager and want to call, the number is (203) 327-2000. Maybe it's not too late to rectify a 25-year-old mistake, after all.



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HARMAN/ KARDON CH160 CAR STEREO

Manufacturer's Specifications

Tuner Section

Usable Sensitivity: Mono, 14.8 dBf.

50-dB Quieting Sensitivity: Mono, 18 dBf.

S/N: Mono, 70 dB.

Alternate-Channel Selectivity: 70 dB.

THD at 1 kHz, 65 dBf: Mono, 0.2%; stereo, 0.4%.

Stereo Separation at 1 kHz, 65 dBf: 45 dB.

AM Sensitivity: 30 μ V.

AM Alternate-Channel Selectivity: 50 dB.

Cassette Section

Frequency Response: 20 Hz to 20 kHz, ± 3 dB, using Harman/Kardon test tape.

S/N: 54 dB; 64 dB with Dolby B NR, 70 dB with Dolby C NR.

Wow and Flutter: 0.09% wtd. rms.

General Specifications

Output Voltage: 775 mV.

Tone-Control Range: Bass, ± 10 dB at 50 Hz; treble, ± 10 dB at 10 kHz.

Loudness Compensation: +10 dB at 80 Hz.

Power Requirements: 11 to 16 V (negative ground), 0.6 ampere.

Dimensions: Chassis, 7 in. W \times 2 in. H \times 5 $\frac{1}{8}$ in. D (17.8 cm \times 5 cm \times 15 cm); nosepiece, 4 $\frac{1}{8}$ in. W \times 1 $\frac{1}{4}$ in. H \times 1 $\frac{3}{8}$ in. D (10.5 cm \times 4.4 cm \times 3.5 cm).

Weight: 3.5 lbs. (1.6 kg).

Price: \$495.

Company Address: 240 Crossways Park West, Woodbury, N.Y. 11797.

For literature, circle No. 90



Harman/Kardon, one of the longest-lived companies in the audio component business, now offers a line of car-stereo equipment whose quality is consistent with what I have come to expect from their home audio products. That is to say, it is excellent. The CH160 tuner/cassette player is a good case in point. The tuner section features frequency-synthesized tuning and permits storage of six AM and six FM station frequencies in memory. Seek and scan tuning are easily initiated from the front panel. When tuning manually, pressing the up/down tuning rocker for more than 1 S speeds up the tuning action. In the scan mode, the tuner pauses at each signal that it intercepts for about 8 S to let you decide if that's the station you want to hear.

Like many well-designed car tuners, this one adjusts stereo separation and soft muting during FM stereo reception in order to provide the best balance between signal-to-noise ratio and separation under weak signal conditions. The tuner also has a special pulse-noise suppression circuit to reduce noise caused by a car's electrical system.

The cassette section uses discrete playback amplifier circuitry and has both Dolby B and C noise-reduction circuits. An equalizer switch accommodates both 120- μ S (Type I) and 70- μ S (Types II and IV) tapes. A music-search feature finds the beginning of a song during fast forward or rewind. Fast-forward and rewind buttons have a locked position so that you don't have to keep pressing them during a lengthy wind. Other convenience features particularly geared to the needs of the driver are automatic replay after rewind, mechanically assisted tape loading, and automatic ejection of a tape when its end is reached or when the car's ignition is turned off.

The preamp section, common to both the tuner and the cassette player, features separate bass and treble controls, switchable loudness compensation, a front-rear fader control, an amplifier remote turn-on lead, a power antenna lead, and a memory backup lead. Discrete circuitry is used in these audio stages. And there are, of course, four separate outputs (all standard RCA jacks) for front and rear amplifier connections.

Control Layout

Three concentrically mounted rotary controls at the left end of the panel adjust volume, bass, and treble. Pushing the knob in the center toggles power on and off, while pulling it turns it into a left-right balance control. Just to the right is a small rotary front-rear fader control, and above this is the cassette eject button (which, in tuner mode, switches the display to show the time).

Buttons for preset memorization and loudness compensation, and six numbered station preset buttons, are arranged across the bottom edge of the front panel. Above these pushbuttons is a multi-function display area. During tuner operation, it shows AM or FM frequency and indicates stereo operation, which station preset is in use, and whether the tuner is in the local mode. In cassette operation, it shows the time and indicates whether music search, Dolby B or C NR, and 70- μ S tape equalization are in use. In either mode, the display also shows when the loudness compensation switch is set. The cassette slot is above the display area.

To the right of all this are two large buttons for fast forward

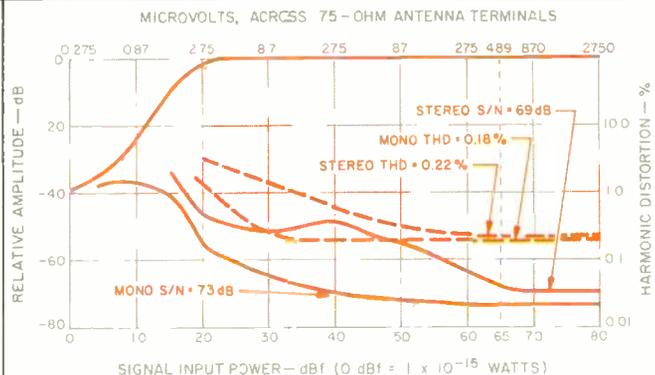


Fig. 1—Mono and stereo quieting and distortion characteristics, FM section.

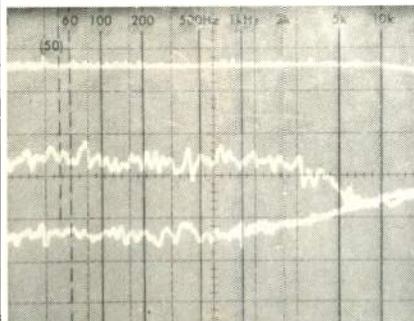


Fig. 2—FM frequency response (top trace), and separation for weak (middle trace) and strong (bottom trace) signals.

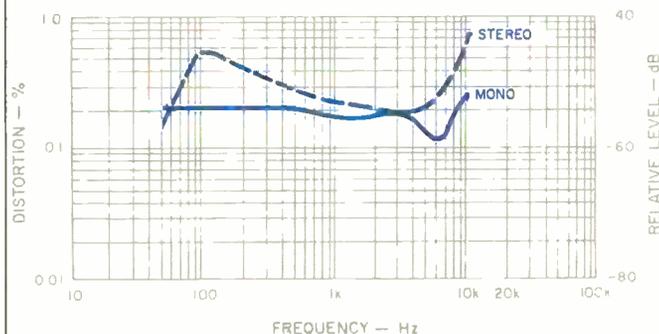


Fig. 3—THD vs. modulating frequency, FM section.

With strong-signal input, separation was 42 dB at 1 kHz and 100 Hz, and 32 dB at 10 kHz. These results are excellent.

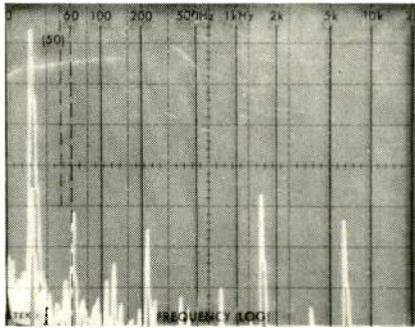


Fig. 4—FM stereo crosstalk and distortion components for a 5-kHz signal.

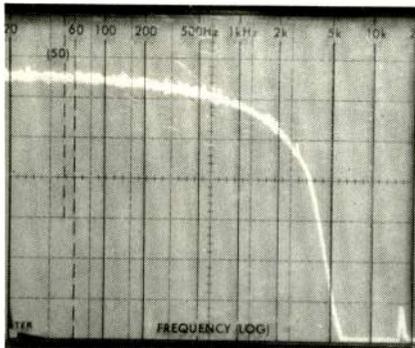


Fig. 5—AM frequency response.

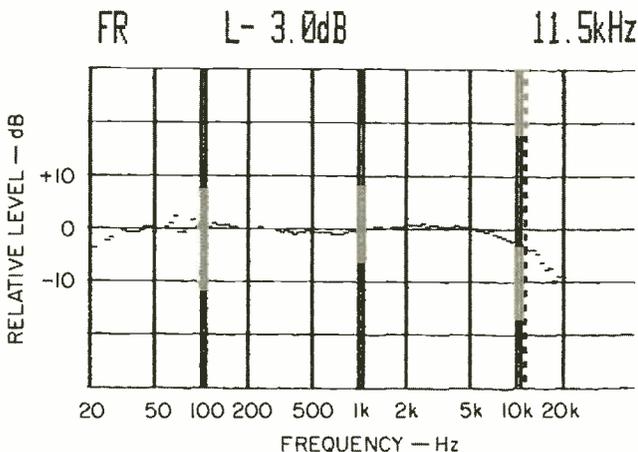


Fig. 6—Frequency response, cassette section, with Type I tape.

and rewind plus five smaller buttons. These are the Dolby on/off and Dolby B/C NR selectors, the music-search button (which doubles as a mono/stereo selector in the tuner mode), a tape equalization selector (which is used to pick distant or local reception when in the tuner mode), and an AM/FM band selector. A pair of large, flat rockers at the extreme right of the panel operate the seek/scan and up/down tuning functions.

Measurements

Figure 1 shows the quieting and distortion characteristics of the CH160's FM tuner section as signal strengths are increased from 0 dBf to well above the standard measurement value of 65 dBf. Though usable sensitivity fell a bit short of the claimed 14.8 dBf (it was 16 dBf for my sample), 50-dB quieting in mono—by far the more important specification—was 18 dBf, exactly as claimed. Stereo usable sensitivity measured 20 dBf, but it's important to note that because of the automatic stereo blending in this and most other tuners when receiving weak signals, there's very little stereo effect to be heard at such a low input level. The 50-dB quieting sensitivity in stereo measured an acceptable 40 dBf. At strong signal levels, signal-to-noise ratio was a very satisfactory 73 dB in mono and 69 dB in stereo. Harmonic distortion for a 1-kHz modulating signal was 0.18% in mono; in stereo it was almost as low, measuring 0.22%.

The top trace of Fig. 2 represents frequency response, plotted logarithmically from 20 Hz to 20 kHz. (The vertical scale is 10 dB per division.) Over the useful FM audio range from 30 Hz to 15 kHz, response was flat to within +0.7 and -0.3 dB. The bottom trace in Fig. 2 shows separation, as referred to the top trace, for a strong-signal input. I measured separation to be 42 dB at 1 kHz and at 100 Hz, and 32 dB at 10 kHz. These are excellent separation figures compared to those of most car tuners I have measured recently. The middle trace shows the effect of the stereo blend. With signal strength reduced to around 45 dBf, separation was significantly lower but was still more than adequate (nearly 20 dB at mid-frequencies, even higher at treble frequencies) to maintain good stereo imaging.

Figure 3 shows how harmonic distortion varies with audio modulating frequency for mono and stereo reception. At all but the highest and lowest test frequencies, THD was almost as low in stereo as it was in mono. Figure 4 shows a pair of traces made using a spectrum analyzer. This time, the sweep is linear, from 0 Hz to 50 kHz. The tall spike at the left represents a 5-kHz signal output from the modulated channel during stereo operation. The spike within the tall one shows the amplitude of 5-kHz crosstalk appearing at the output of the opposite, unmodulated channel. Notice that although actual 5-kHz separation is quite good (approximately 36 dB), there are other unwanted components appearing at the output of the unmodulated channel, such as harmonics of 5 kHz, subcarrier components at 19 and 38 kHz, and sidebands around the 38-kHz residual output.

Alternate-channel selectivity measured 68 dB, close enough to the 70 dB claimed by Harman/Kardon. Capture ratio measured a very good 1.5 dB, and image rejection was greater than 75 dB. AM suppression was also very good, measuring better than 55 dB.

I liked the scan tuning. Eight seconds of music is long enough to help you pick a station, but not so long that the process is unduly delayed.

The AM section's frequency response was disappointing. Although I have not come to expect wide-band response from tuner components (least of all from car tuners), I expected the CH160 to exhibit flat response to beyond 2 kHz. Instead, roll-off began at around 1.5 kHz (Fig. 5).

Cassette Player Measurements

Figure 6 shows the playback response of the tape deck, using a Type I test tape that has a sweep frequency from 40 kHz downward to 20 Hz. The disappointing results (response was down 3 dB at 11.5 kHz) made me suspect that the problem had to do with azimuth alignment of my test tape relative to that of the playback head. I became even more convinced of this when I plotted response for a Type II tape manually, using a special BASF calibrated tape. Recording the amplitude values for the spot frequencies recorded on this second tape, I was pleased to find that response was virtually flat all the way out to 18 kHz, the highest test frequency on the BASF test tape. Suspecting that such a great difference in response between Type I and Type II test tapes was not the fault of the CH160, I temporarily replaced my sweep-frequency tape with a borrowed Type I test cassette having the same spot frequencies as my Type II tape. Sure enough, this gave flat response out to 16 kHz. Even the best tape can give erroneous results if any of its parameters, such as azimuth alignment, are significantly off.

Signal-to-noise ratios, with and without Dolby B NR and with and without Dolby C NR, as analyzed using a Sound Technology 1500A tester, are shown in Figs. 7A and 7B. The upper plot in each graph shows S/N without Dolby NR; it measured 57.8 dB the first time and 58.4 dB the second, considerably better than the 54 dB claimed. With Dolby B NR, S/N increased to 65.3 dB, also better than the published spec. Dolby C NR added another few dB to the S/N reading, bringing it up to 69.2 dB, close enough to the claimed 70 dB so that I wouldn't quibble over the difference.

Wow and flutter (Fig. 8) was also better than claimed, measuring only 0.075% wtd. rms as against the 0.09% claimed. Azimuth error (Fig. 9) was a rather high 173° for a 15.8-kHz signal recorded on both the left and right channels of my test tape. Interestingly, this test tape, specifically designed for use with my Sound Technology tester, was provided by the same laboratory that produced the Type I frequency response tape that gave such poor results earlier. I believe that the head alignment on the Harman/Kardon player is probably closer to true perpendicularity than is my azimuth-checking tape. In any case, the CH160's head positioning seems to match the BASF test tapes better than it does the Sound Technology test tapes.

Figure 10 shows the typical "bow tie" pattern obtained by running successive sweeps of frequencies from 20 Hz to beyond 20 kHz and turning the tone controls to their maximum and minimum settings. (I used the FM tuner section, which I had already established as having excellent, flat response.) I measured a bass boost and cut range of +10.2, -9.3 dB at my usual 100 Hz; at the 50 Hz which Harman/Kardon uses for its spec, the range I measured is even a bit wider. For the treble control, I measured a boost and cut range of +10.9, -9.6 dB at 10 kHz (not shown).

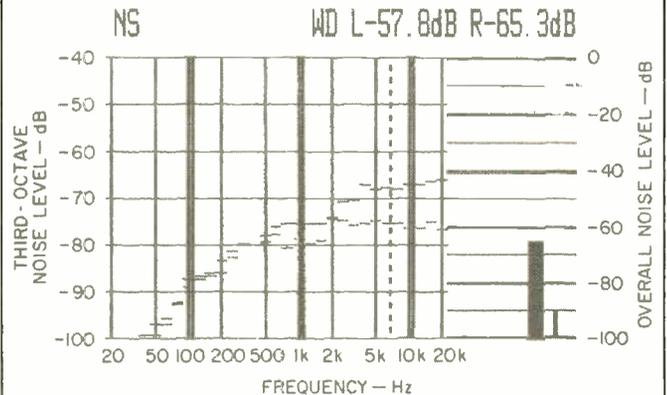


Fig. 7A—Tape S/N analysis, A-weighted, without noise reduction (upper trace and "L" readout at top) and with Dolby B NR (lower trace and "R" readout).

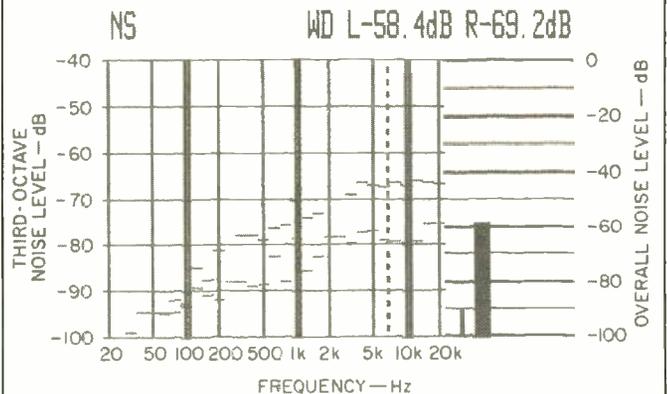


Fig. 7B—Same as Fig. 7A but without (upper trace and "L" readout) and with Dolby C NR (lower trace and "R" readout).

Use and Listening Tests

Technical Editor Ivan Berger, who checks out car-stereo units by giving them a road test in his own car, will no doubt comment about the ergonomics and real-world performance of this Harman/Kardon head unit. I can only report that in my laboratory, the tuner performed very well indeed. The pacing of the scan function enabled me to judge whether I wanted to lock in the scanned station. I can't see the point of scanning circuits found in some head units that let you listen for less than 5 S before they move on to the next station. The 8 S provided by H/K is enough—but not so long that it delays the process unduly. Memorizing preferred AM and FM frequencies couldn't be easier, and the panel's clock was clearly visible when I positioned myself as if I were in a driver's seat relative to the front panel. The fea-

Tape playback was a hair cleaner and more extended than my reference set's, and the transport handled potholes without a twinkle of speed instability.

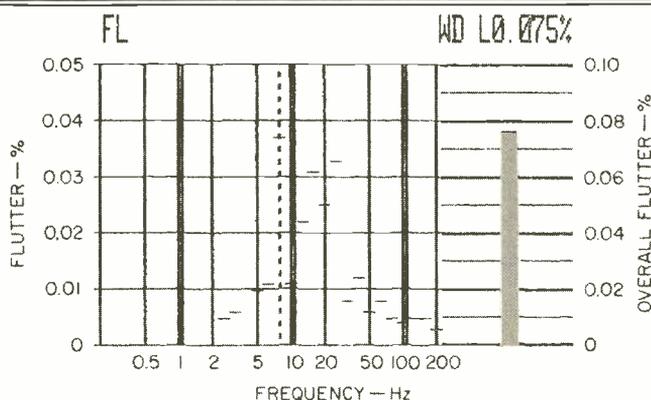


Fig. 8—Analysis of wow and flutter.

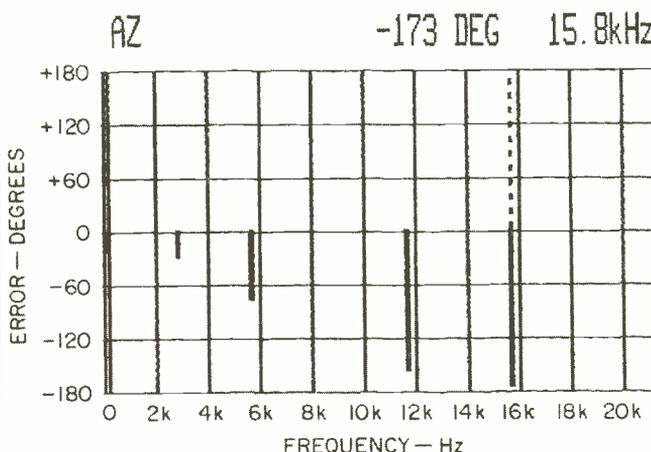


Fig. 9—Playback-head azimuth error.

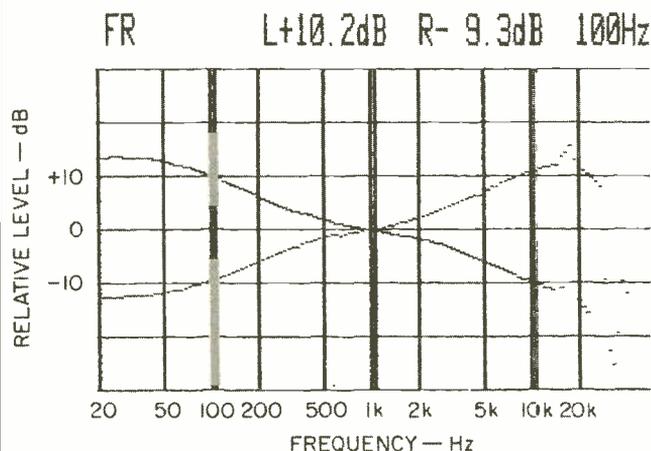


Fig. 10—Tone-control range.

tures incorporated into the tape player were equally easy to access, and I especially liked the locked fast-winding modes. So, unless something negative shows up during Mr. Berger's highway tests, I'll vote in favor of the Harman/Kardon CH160. Over to you, I.B.!

Leonard Feldman

Behind the Wheel

The Harman/Kardon CH160's features are well chosen, and its panel is well designed. All major controls could be operated without looking, with the exception of the station-selector buttons. Having six station buttons in a row is too many, in my view; Harman/Kardon compounded the problem by adding the memory and loudness buttons, for a row of eight. The other small buttons were better placed, with the four least-used controls (for tape NR, EQ, and music search, and for local/distant and mono/stereo tuning selection) in a compact square, and the more often-used "FM/AM" placed below the square for easy access. The large tuning-control rocker pads were easy to find and use, and I welcomed being able to seek and scan in both directions, even if the maker's way of doing it took a bit of getting used to (seek/scan direction depends on the direction in which the manual tune button was last used).

The display, like many LCD displays, has less contrast than I like for easy reading, but its numbers were adequately clear. The many small indicators at the right of the display screen were too small to read, but one would soon learn to read them by position.

The controls were well illuminated when the CH160 was turned on, but everything was black until then. Since the on/off switch is on the only projecting knob, it's easy to find in the dark, but a lighted tape slot would also have been welcome for times when one isn't interested in using the tuner. The slot is not lit when the unit is on, either, but it's so outlined with lighted buttons that it's not hard to find.

The CH160's FM tuner section seemed a bit more sensitive than my reference set's, picking up a few more listenable stations in a fringe location 50 miles from New York. However, its multipath resistance and sensitivity to picket-fencing were not quite as good as the reference set's. The stereo/mono switch proved its value in cleaning up poor signals, as it does on most of the few car stereos which feature it. My reference set brought in several recognizable but unlistenable poor signals which the CH160 ignored, probably a sign that the latter has a higher muting threshold. On AM, the major difference was the CH160's high-end roll-off—bothersome, even though it did reduce apparent noise on one or two otherwise unlistenable stations.

I was happier with the tape performance. The sound was a hair cleaner and more extended than my reference set's, and the transport handled frost heaves and potholes with not even a twinkle of speed instability. I did not like having the tuner come on during fast-wind operations, but one can shut it off.

All in all, this is a fine package of well-thought-out features, very good (if not breathtaking) performance, excellent sound, and fine human engineering, all at an eminently reasonable price. It even fits conventional two-knob dashboard slots, despite its slightly unconventional styling. Nice.

Ivan Berger

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Pure Chrome! It's the secret! Pure Chrome! It's the reason! Pure Chrome BASF Chromdioxid Maxima II. It's producing the sound that every other tape in the world wants to sound just like. Because it's the only tape in the world that delivers pure sound in all its brilliance. The only tape in the world made of perfectly shaped chromium dioxide particles in an exclusive formulation that delivers extremely low background noise.

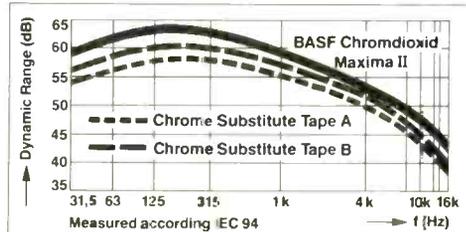
It all adds up to unbelievable sound reproduction. Unbelievable sensitivity in the critical high frequency range. In fact, it's the improved formulation of Chromdioxid Extra II, the official world standard for Type II high bias tapes.

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2

SHERWOOD CRD-180 CAR STEREO

Manufacturer's Specifications

FM Tuner Section

Usable Sensitivity: Mono, 20.7 dBf.

50-dB Quieting Sensitivity: Stereo, 46.8 dBf.

S/N: Mono, 66 dB; stereo, 64 dB.

Alternate-Channel Selectivity: 65 dB.

Capture Ratio: 1.5 dB.

Stereo Separation: 35 dB.

AM Tuner Section

Sensitivity: 40.8 dBf.

S/N: Mono, 50 dB; stereo, 45 dB.

Stereo Separation: 28 dB.

Cassette Section

Frequency Response: Type I tape, 30 Hz to 15 kHz; types II and IV tape, 30 Hz to 17 kHz.

S/N: 53 dB; 62 dB with Dolby B NR.

Wow and Flutter: 0.2% wtd. rms.

General Specifications

Output Voltage: 1 V at 50% FM modulation.

Average Power Output, 4-Ohm

Load: 3.5 watts/channel, 50 Hz to 20 kHz, for 0.5% THD; 6 watts/channel at 1 kHz for 10% THD.

Frequency Response: 15 Hz to 30 kHz, -3 dB.

Tone-Control Range: Bass, ± 10 dB at 100 Hz; treble, ± 10 dB at 10 kHz.

Loudness Compensation: +8 dB at 100 Hz and at 10 kHz, for -30 dB volume setting.

Dimensions: Chassis, 6 $\frac{1}{8}$ in. W \times 2 in. H \times 5 $\frac{1}{8}$ in. D (16.8 cm \times 5 cm \times 13 cm); nosepiece, 4 $\frac{1}{8}$ in. W \times 1 $\frac{1}{8}$ in. H \times 1 $\frac{1}{2}$ in. D (10.5 cm \times 4.2 cm \times 3.7 cm).

Weight: 3.3 lbs. (1.5 kg).

Price: \$249.95.

Company Address: 13845 Artesia Blvd., Cerritos, Cal. 90701.

For literature, circle No. 91



Although the Sherwood CRD-180 incorporates a built-in amplifier and therefore is classed as a receiver rather than as a head unit, I chose to deal only with its head-unit features for reasons which I will explain in a moment. As a car-stereo tuner/cassette player with a preamplifier output, it offers several desirable features, such as six AM and six FM station presets, Dolby B noise reduction, scan tuning, tape equalization selection, tape program searching (assuming that there are blank spots on a tape), and local/DX radio reception modes. It is also one of a very few car-stereo receivers to incorporate stereo AM. Instead of a universal decoder, which works with all FCC-approved AM stereo systems, Sherwood's decoder responds only to signals from stations using the Motorola C-Quam system. Since some stations support C-Quam and others employ the Kahn-Hazeltine system, your chances of receiving AM stereo with the CRD-180 depend upon which system is being used by the broadcasters in your area.

The amplifier section of this receiver is relatively low powered for an otherwise excellent and moderately priced head unit. Most of the amplifier sections built into in-dash units are of similarly low power—because of the laws of physics. Without some sort of power-supply voltage step-up system, such amplifiers must work with the car's nominal 12-V supply, equivalent to a voltage swing of ± 6 V. The maximum theoretical power output is 4.5 watts. Sherwood's rating for the CRD-180 of 3.5 watts/channel continuous power is, therefore, a realistic one. The rating of 6 watts at 10% distortion is probably also realistic. Presumably, Sherwood lists it for comparison with the specs of those car-stereo makers who publish only power ratings measured at this high level of distortion. At 10% THD, the output waveform looks more like a square wave than a sine wave, and the sound is unlistenable.

Control Layout

The CRD-180 has a rather basic and simple panel layout. Dual-concentric rotary controls are at the panel's left and right ends. The inner knob at the left controls power on/off and volume. When it's pushed, it toggles the main display from frequency to clock time. The outer ring at the left serves as the bass control; when pushed, it controls treble. The inner knob at the right end of the panel manually tunes up and down the AM or FM bands, or reverses tape-play direction. This knob also adjusts the clock time when in the clock-set mode. Pushing the same knob activates scan tuning. The outer ring on the right serves as a left-right balance control, or, when pushed, as a front-rear fader control.

The cassette loading slot is in the usual location, at the top center of the control panel. Below the slot are the six numbered preset buttons and the LCD display. In addition to showing tuned-to frequencies, the display shows which numbered preset has been selected, whether a stereo signal is being received, and whether the local reception mode has been selected. To the right of the cassette slot are tape fast-forward and fast-rewind buttons; under these are four more pushbuttons, two of which perform dual functions. The button labelled "ME," besides choosing 70- μ S equalization (for metal or chrome tape), is also used to initiate clock

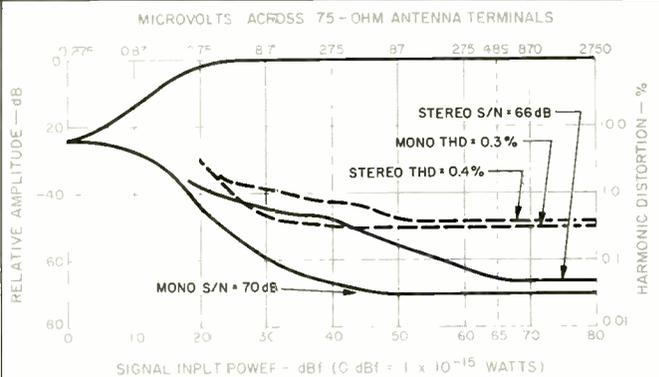


Fig. 1—Mono and stereo quieting and distortion characteristics, FM section.

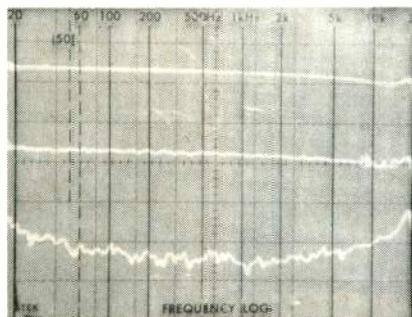


Fig. 2—FM frequency response (top trace), and separation for weak signals (middle trace) and strong signals (bottom trace).

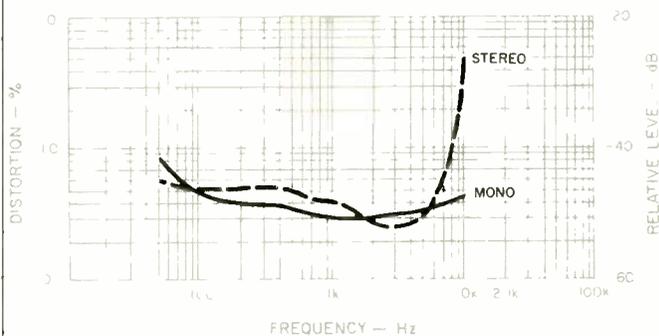


Fig. 3—THD vs. frequency, FM section.

This is one of a very few receivers for the car to incorporate AM stereo, though it will pick up only those stations using the Motorola C-Quam system.

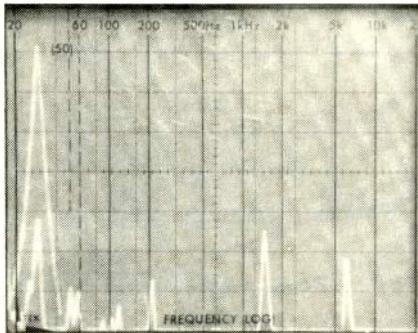


Fig. 4—Distortion and crosstalk for 5-kHz modulating signal, FM section.

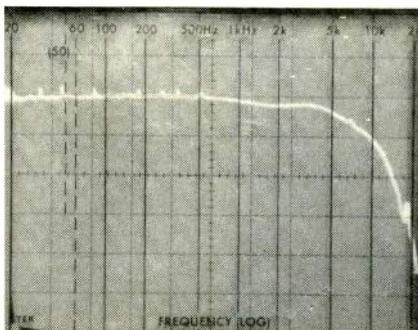


Fig. 5—AM frequency response.

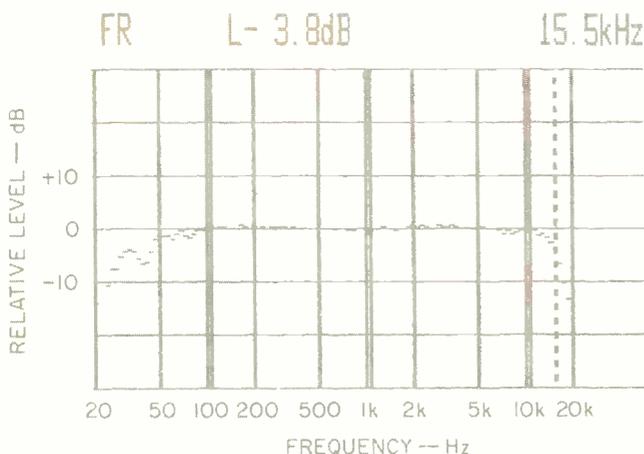


Fig. 6—Frequency response, tape section, using Type I test tape.

setting. The button labelled "LO" selects local reception in the tuner mode; it is also used to turn Dolby B NR on and off when in the tape-play mode. The remaining two buttons handle tape program search and select the AM or FM radio band.

Tuner Measurements

As usual, I measured the performance of the tuner section first, and then went on to evaluate the tape section. As for how the unit behaves on the road, once again I'll leave that to Technical Editor Ivan Berger, who has, by now, traversed just about every major highway and byway in the New York City area checking out the latest car-stereo products.

Figure 1 shows how background noise and distortion vary with signal strength for mono and stereo FM input signals. Usable sensitivity in mono measured 20.3 dBf, almost exactly the value specified by Sherwood. In stereo, it was 22.0 dBf, but of course, at this signal level there was very little stereo separation left because of the blending effect incorporated into this and most car-stereo tuners these days. In stereo, 50-dB quieting sensitivity measured 44.0 dBf, and in mono the figure was about 22 dBf. Best signal-to-noise ratio (for a 65-dBf input signal) was better than specified: 70 dB in mono and 66 dB in stereo. THD, for a 1-kHz signal, measured 0.3% in mono but increased to 0.4% for stereo.

Figure 2 shows FM stereo frequency response (top trace) as well as separation for strong and weak stereo signals. Response was generally flat from 30 Hz to 15 kHz, but a slight dip at around 10 kHz, followed by a rise just before the final cutoff above 15 kHz, can be seen. The middle trace in Fig. 2, for weak-signal separation, shows the effects of the blending I mentioned earlier. At strong signal levels (bottom trace), separation measured a very high 49 dB at mid-frequencies. When signal levels were reduced to about 40 or 45 dBf (middle trace), separation decreased to just over 20 dB; notice, however, that separation remained at this level over the entire audio spectrum. Many FM tuners exhibit poorer separation at the frequency extremes than at mid-frequencies, especially at low signal levels, but that was not the case with this Sherwood unit. Again, at strong signal levels, separation at 100 Hz measured 45 dB, and at 10 kHz it measured 35 dB.

Figure 3 shows how harmonic distortion varies with frequency for mono and stereo FM reception at strong signal levels. Often, the single "distortion" reading observed for a stereo FM tuner when it is receiving a high-frequency signal is not really a true indication of what's going on. In order to separate the actual distortion products from other spurious outputs, I used a spectrum analyzer, linearly swept from 0 Hz to 50 kHz, to plot what happens at the output of the unmodulated channel when a 5-kHz signal is used to modulate the opposite channel fully. In Fig. 4, the tall spike at the left represents the amplitude of the desired 5-kHz output, while the shorter spike within it represents the 5-kHz output from the unmodulated channel. The other crosstalk components appearing at the unmodulated channel's output include harmonic distortion components and subcarrier output products at 19 and 38 kHz, as well as sidebands. Actual separation at 5 kHz measured an excellent 43 dB. (The vertical scale in Fig. 4 is 10 dB per division.)

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TECHNICAL INFORMATION

Amplifier Gain: Adjustable 0 to 24dB.

Amplification: Capable of amplifying incoming signal up to 18 times. **Selectivity:** 0 dB gain at 50 MHz and at 150 MHz.

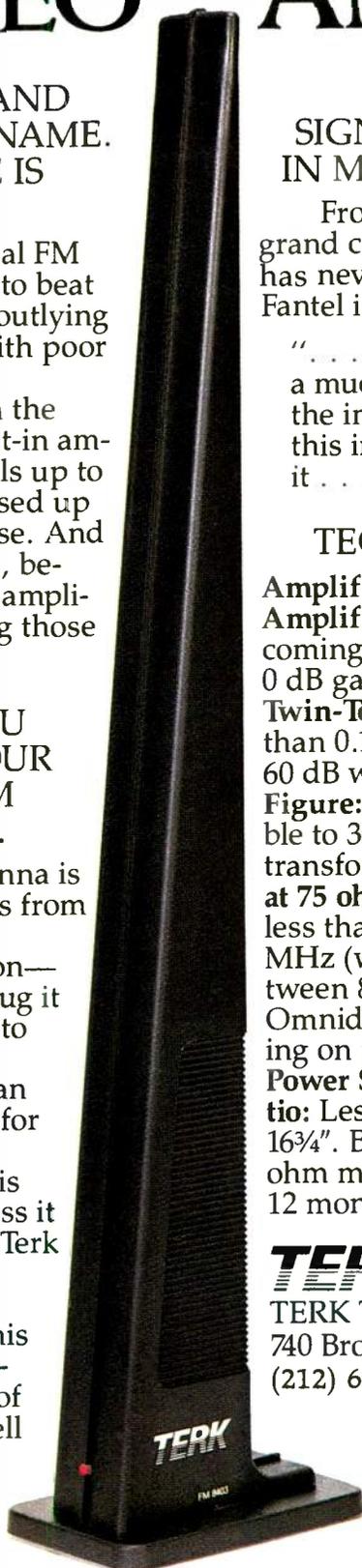
Twin-Tone Modulation Distortion: Less than 0.1% at 100mV. **Distortion:** Less than 60 dB with an output of 100 mV. **Noise Figure:** 3dB. **Impedance:** 75 ohm adaptable to 300 ohm input with matching transformer.

Output Matching Accuracy at 75 ohms: SWR (Standing Wave Ratio) less than 1.2:1 **Operating Band:** 5 to 150 MHz (with optimal amplification between 88 and 108 MHz.) **Pickup Pattern:** Omnidirectional, or directional (depending on physical orientation). **Range:** 360°.

Power Supply: 110V. **Stationary Wave Ratio:** Less than 1.2:1 **Dimensions:** Height, 16¾". Base, 2¼" x 3½". Includes 75/300 ohm matching transformer. **Warranty:** 12 months.

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Many FM tuners exhibit poorer separation at the frequency extremes than at mid-frequencies, especially with weak signals, but that was not the case here.

Capture ratio of the FM tuner section measured exactly 1.5 dB, as claimed. Alternate-channel selectivity was 68 dB, exceeding the manufacturer's spec.

AM frequency response, shown in Fig. 5, was far better than what I have come to expect from car and home tuners and receivers. Response was virtually flat out to 5 kHz, and reached the -6 dB point at around 7 kHz. No doubt the improved AM response is related to the AM stereo circuitry incorporated in this receiver. As for its stereo AM capabilities, I'm going to have to leave that discussion up to Ivan Berger, who, I hope, will drive far enough to find an AM stereo station that utilizes the Motorola C-Quam system. There were none in my immediate listening area, nor was I able to test the performance of the AM stereo decoder in the lab. (If AM stereo becomes important enough, I may have to equip the lab with an AM stereo generator. But until a single standard becomes dominant, I'm holding off. I don't want to have to buy *two* such generators!)

Cassette Player Measurements

Figure 6 is a plot of playback response using Type I (normal bias) tape recorded with a sweep signal that can be read by a Sound Technology 1500A tape tester. Response was reasonably flat to around 15 kHz, as claimed. For checking Type II tape response, I used a spot-frequency test tape supplied by BASF, and therefore had to record results manually. Using this calibrated test tape, with equalization correctly set, response actually seemed poorer than with the normal tape. I can only conclude that the azimuth alignment of the playback head corresponded more closely to the Type I test tape than it did to the Type II tape. (In several of my more recent tests of car stereos, I found that the reverse was true.)

Figure 7 shows two measurements of signal-to-noise ratio. Values of 58.0 and 65.5 dB, A-weighted, were obtained without and with Dolby B NR, respectively. Figure 8 is an analysis of wow and flutter. In my tests, I obtained an overall reading of 0.15% wtd. rms, somewhat better than the 0.2% claimed, but certainly not an exceptionally good wow-and-flutter figure in light of today's crop of better car-stereo cassette mechanisms.

Azimuth error, plotted in Fig. 9, amounted to 136° for a 15.8-kHz test signal. That is to say, the angular tilt of the playback head, compared to the orientation of the left and right tracks of my calibrated azimuth test tape, was enough to make the phase error between 15.8-kHz signals in the left and right channels equal to 136°.

Figure 10 shows the range of the CRD-180's bass and treble controls. With the bass control, maximum boost and cut (+10.6, -10.5 dB) was achieved at 105 Hz; with the treble control, maximum boost and cut (+5.43, -11.0 dB) was achieved at 10 kHz.

Use and Listening Tests

Considered as a head unit, I have no hesitation in recommending the Sherwood CRD-180 as a well-designed, moderately priced tuner/cassette player that is worth a listen. After all, not everyone wants every single frill and feature that engineers can dream up for car-stereo products. Some of us are content to have a reliable car stereo that has all the

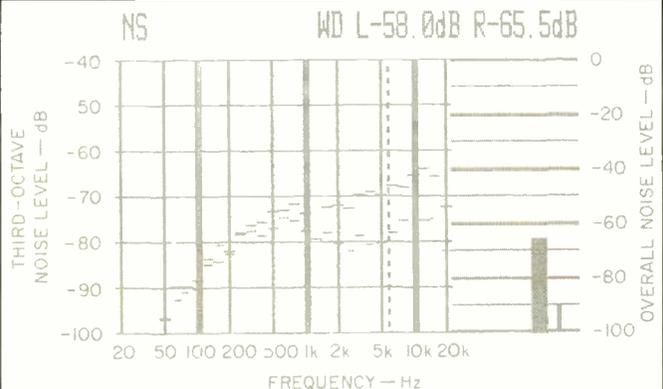


Fig. 7—Tape section S/N, A-weighted, without noise reduction (upper trace and "L" readout at top) and with Dolby B NR (lower trace and "R" readout).

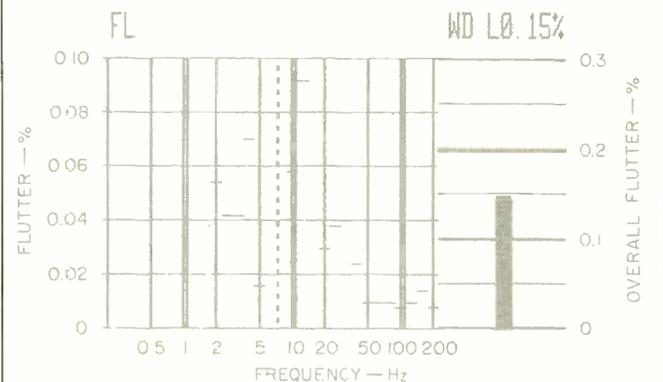


Fig. 8—Wow and flutter, wtd. rms.

basics, and that is trouble-free and easy to operate. This Sherwood unit certainly meets those criteria. As for its signal-pulling power, its resistance to multipath and picket-fencing while in motion, and its ability to deliver acceptable (if not super high-fidelity) AM stereo, I'll leave those conclusions to Ivan Berger. Personally, I'm not too upset at not having been able to tune to a local AM stereo station that uses the C-Quam system. Even though there are a couple of stations in my area using the alternate Kahn-Hazeltine sys-

Ease of use, a reasonable mix of features, and solid performance make this a good set; its price makes the Sherwood a steal.

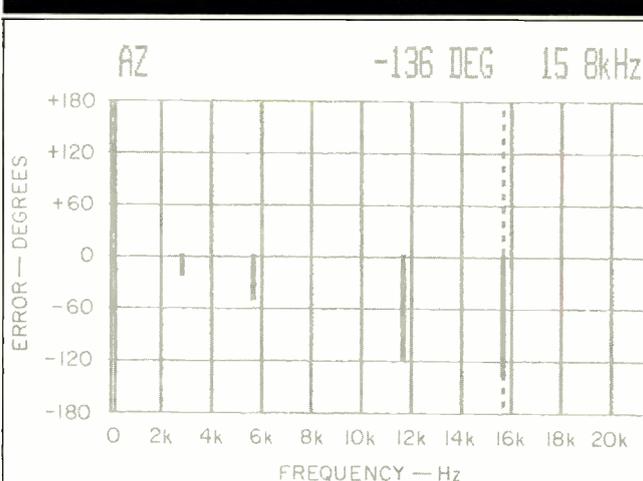


Fig. 9—Azimuth error of playback head.

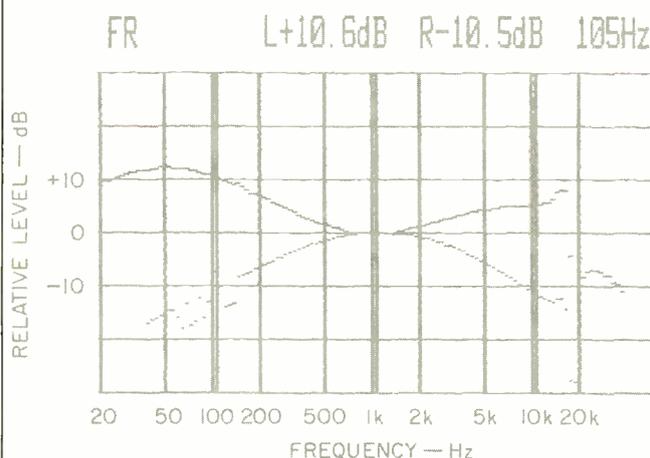


Fig. 10—Tone-control range.

tem, I haven't rushed out to re-equip my home or my car with that kind of AM stereo either!

Leonard Feldman

Behind the Wheel

The Sherwood's pleasantly un-exotic panel design manages to hold controls for a fair number of functions without crowding; a few buttons must serve double duty to accomplish this. There is no night illumination until the unit is turned on—no problem in a knob-controlled set like this one, since

the left knob is easy to find in the dark. Once on, the controls become easy to spot.

There's a slight emphasis on radio over tape, in that the tuner section has more controls and is marked a bit more legibly, with only the radio-function legends lighting up in the dark. Selecting tape EQ via the right-hand knob, rather than with a separate button, took only a short time to get used to. This is also the first unit I've seen in quite a while whose clock controls were so clear that I could set the time without consulting the manual.

Sherwood's arrangement of having both full-band and preset scan controls struck me as more useful than the more common setup of seek plus preset scan. The arrangement of the six preset buttons in a 3 × 2 grid was more convenient than the usual single row. The multi-function knobs at each end caused no confusion, but I could not find the center detent on the treble control. The display is a bit low in contrast, like most LCDs, but still readable, by day or night, over a wide range of viewing angles.

The output setup, with amplified outputs for the front and preamp-level outputs for the rear (usable the other way around, if you prefer), is not an overly common practice, but still a good one. It gives you the option of using the CRD-180 with its built-in amp, with an external amp, or with its built-in amp for one end of the car plus a more powerful, external amp for the car's other end. Preamp-level outputs are standard RCA jacks; power connections are separate wires, exceptionally well marked.

Tape performance seemed a tad better than it was on my reference set, at least on tapes made with Dolby B NR; I would have preferred to have Dolby C NR as well, however. I heard no wow and flutter, even when driving over extraordinarily rough roads.

The FM section brought in more stations more clearly than my reference system did, but most of that better performance was due to the presence of a number of weak stations, which the Sherwood received poorly but which my reference set did not pick up at all. The difference is probably due either to the Sherwood's auto blending (a feature my reference unit lacks) or to a difference in muting levels. Eliminating those poor signals from the count, I found that the CRD-180 brought in about 10 stations better than my reference set did—but that the reference set picked up about 10 other stations better than the CRD-180 did. This was a bit surprising, since there was no obvious pattern (such as one tuner being better at the low end of the band and the other being better at the high end).

On AM, the picture was much more straightforward: The Sherwood picked up quite a few more listenable stations than my reference unit, and sounded clearer most of the time. I did pick up one AM stereo station (WMTR, in New Jersey); the sound was unmistakably stereo, but just as unmistakably AM. Not even counting its stereo ability, the CRD-180's AM section is pretty good; only one unit I've tested for this magazine (and that a far more expensive model) has surpassed it.

The Sherwood CRD-180 is easy to use, performs well, and has a reasonable mix of features (Dolby C NR is the only fancy feature that I really missed). That makes it a good set; its price makes it a steal.

Ivan Berger

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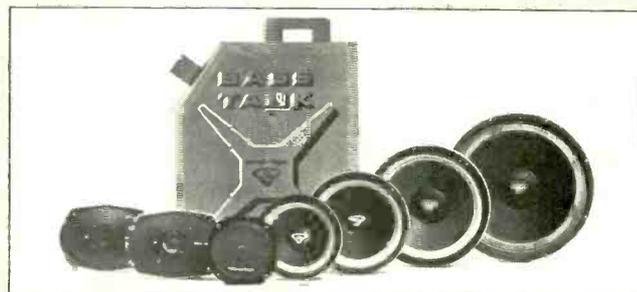
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Yamaha's YGE-600 (\$219) is a five-band equalizer with a valuable extra—an automatic circuit which raises and lowers system volume as ambient noise goes up and down.

The volume-controlling feature first attracted me to the YGE-600; since my system is fairly flat, I have little need for an equalizer per se. On the road, this feature did just what I had hoped it would, letting me hear the music above the road noise without having to dive for the volume control when I stopped.

car stereo, just as 10-band equalizers are at home. In both cases, that's too few bands for fine correction of system or acoustical problems, but a reasonable number for extra-precise tone control. Five-band models are preferred in the car because they are more manageable (vital, when you want to operate one while you drive) and more compact.

With the YGE-600's all-electronic control setup, five bands are also the maximum a driver could handle safely. To set this equalizer, you must press the "Band" selector button one or more times, until the display for the band you want begins to flash, and then press the appropriate end of a boost/cut rocker button. You can't do this without watching the display, which can be a hazard on the road.

One way around this problem is to use the factory- and user-preset memories. Then you can find the button for the memory you want by touch, and use the big, comfortable rocker switch

programmed settings proved more useful than I would have supposed. To me, the most useful one was the "Acoustic EQ" button, which adds a boost at about 45 Hz, a dip at 300 Hz, and a milder boost at about 8 kHz to counteract some acoustical peculiarities common to many cars. The "Bass" preset curve boosted bass at about 50 Hz and rolled it off just above 10 kHz or so. The "Middle" button added a very broad boost that centered at about 2 to 5 kHz (see what I mean by broad?). And the "Treble" setting rolled response off at a frequency a bit below 100 Hz and boosted it at 12 kHz. I have not mentioned the degree of boost or cut because it's relative, depending on what you do with the equalization-level rocker switch.

The YGE-600's audio connections are standard RCA jacks, with separate leads for power and ground. The unit is fairly compact, only 2 inches high by 6¼ inches wide and 4⅞ inches deep. For the record, the unit has a rated



The Auto Volume circuit worked smoothly, especially once I had adjusted its front-panel setting. In my car, which is fairly noisy, the system worked best with the control nearly at its maximum. The automatic adjustment range is deliberately limited: Yamaha's instruction manual shows a level change of only 14 dB for a 20-dB change in ambient noise.

The equalizer section has five bands, with seven memories to hold preset equalization curves. Four of these curves are set at the factory, the other three by the user. Five equalizer bands are the standard compromise in

to adjust the degree of compensation imposed for each curve—accentuating, softening, or even inverting it. I get the feeling that Yamaha intended this to be the main method of frequency adjustment on the road. There are two minor drawbacks to this—six of the seven preset buttons are in one long row along the bottom of the control panel, which makes the middle buttons hard to find without looking, and the lack of an EQ bypass control means you must dedicate one of the three user memories to flat response if you want that as one of your options.

However, the four factory-pro-

input sensitivity of 1 to 5 V and a 1-V rated output. Yamaha specifies S/N at 95 dB (A-weighted) and lists THD at less than 0.02%.

The YGE-600's fine performance as an automatic volume leveller both enhances and outshines its worth as an equalizer. At that, the equalizer's only problem is indifferent human engineering for use in the car. I'd recommend the YGE-600 for a system like mine—already pretty flat and with adequate tone controls—where one could use its volume leveller all the time, its preset EQ curves frequently, and its manual EQ controls rarely.

Ivan Berger

FIRESTARTER



Legend: Bob Marley and the Wailers
Island 610 255-222 CID 103.

Legend is a remarkable album. In musical style, its distinctive, loping, off-the-beat reggae rhythm holds together Caribbean, R&B, and gospel influences. In lyrical content, these songs deal with religion, social injustice, mortal love, and music, in that order of concern. It's no wonder that the burning intensity of reggae set fire to the tissue-thin pop music of the '70s and influenced the work of artists as diverse as The Police, Men at Work, Eric Clapton, and Blondie.

This posthumous release includes some of the best and/or most popular songs recorded for Island Records by Bob Marley and the Wailers from 1973 to 1980. These also happen to be

some of the most riveting cuts in the reggae repertoire: "I Shot the Sheriff," "Get Up Stand Up," "No Woman No Cry," "Jamming," and "Stir It Up." Although the production quality varies somewhat from cut to cut, the digital reworking of this 1984 original analog opens up new vistas of sound, as reggae's regular, hesitant beat and Marley's restrained instrumentation incorporate silence as a steady element in the structure of each song. With the exception of a few spots of mild tape hiss, the silence is deep and clean.

Thonking, ticking, swooshing, grinding, booming drums and percussion are the lifeblood of this disc, and the reproduction of every nuance is splendid. Big steel drums roll cleanly out of thin air, and the imaginative percussive arrangements are a constant delight.

Vocal and instrumental imaging are exquisite; there is a palpable sense of depth and breadth. (One exception is "I Shot the Sheriff," an early cut rather primitively produced.) Overall, the sound is alive and kicking.

Marley's brief candle burned bright and rock-steady. *Legend* is a fitting memorial, bearing the glow of his music and message into the '80s and beyond.

Paulette Weiss

The Silver Collection: Wes Montgomery Verve 823 448-2.

This volume from Verve's Silver Collection presents an excellent survey of Wes Montgomery's distinctive, easy-going guitar style. The collection includes some live tracks and some studio tracks mostly with a small group, though a few were done with larger big band and string ensembles. All were recorded in 1965 and 1966.

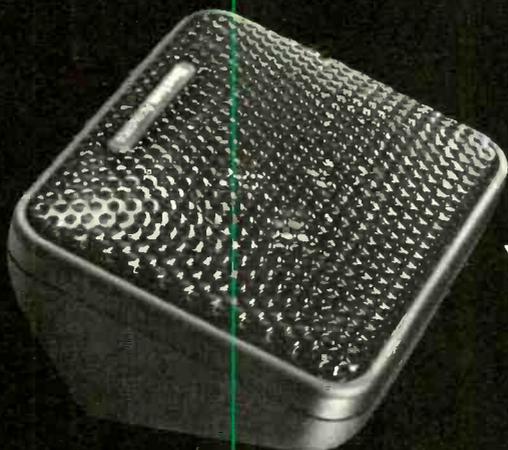
My favorite track is Erroll Garner's irresistible "Misty," arranged for big band by Claus Ogerman. Montgomery goes fairly far afield, but always retains a sense of identity with the original. Partway into the track, the tempo picks up and Montgomery takes the beginning fragment of the melody through some fascinating transformations. The rhythms acquire a shuffling, swing-like character as he departs from the main idea. Slyly, towards the end of the cut, he sneaks back to a comfortably recognizable recap.

Ogerman uses simple trombone and flute colorations and a sax counter-melody to set off Montgomery's inventive improvisations. Regrettably, Ogerman's arrangement is not especially interesting.

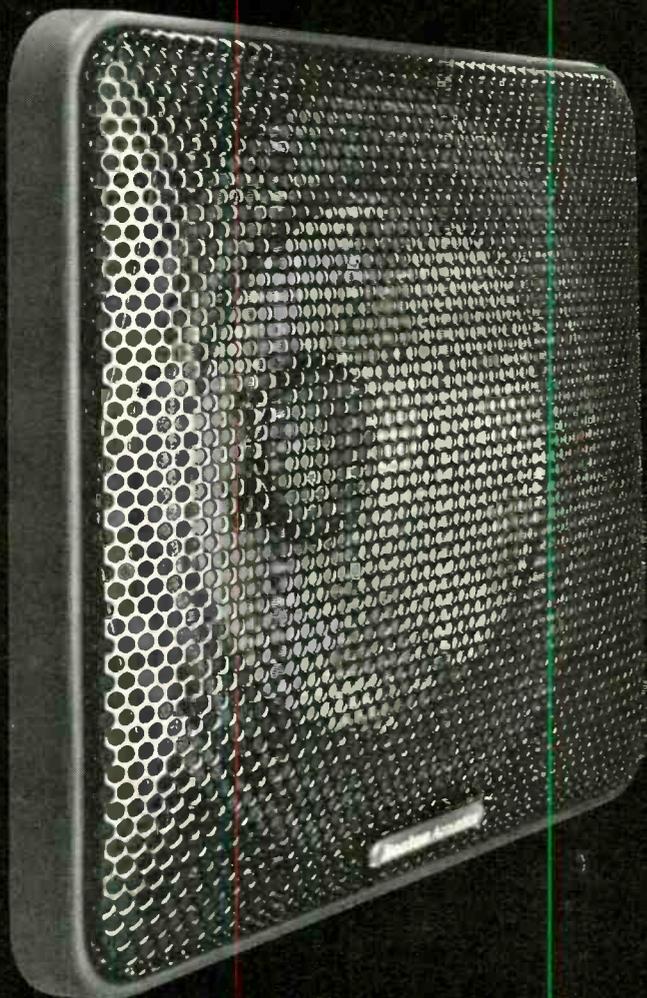
Listen to Montgomery fly with John Coltrane's "Impressions." He takes a fragment at a time, spinning off endless variations before going on to the next. He uses Coltrane's approach but keeps his own style. However, I kept wondering where the bass was. It's essential, but almost inaudible.

Since these tracks were recorded in at least three different locations, you'll hear changes in acoustic perspective. All were produced by Creed Taylor and engineered by Rudy Van Gelder, so they have a stylistic coherence, and the differences slip past easily.

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Boston Acoustics

Wes Montgomery recorded these tracks in different locations, but they still have stylistic coherence.

The first four tracks are live at the Half Note, with rather close miking and not much room ambience. Track 5, a studio track, is noticeably drier. The stereo perspective is typical of the period: Guitar and organ in the center, with the drums split left and right, and no depth of field at all. Track 7 takes you back to the Half Note, and a bit of ambience and depth of field return.

In the big band material (tracks 8 and 9), the same approach to channel assignment is apparent. Montgomery and his group are in the center, with the band split left and right. This sounds logical and clean on the finished product, and at the time was the preferred way to record such an ensemble. Today, a minimal-mike producer would attempt to put the solo group at the front as well as in the center. The band would be spread out behind them, with no interruption in the middle.

The booklet documents the performers, dates, places, and technical staff. Anyone who knows Wes Montgomery's style will recognize the value—and the pleasure—this collection can provide.

Mr. Mister



Unfortunately, the booklet doesn't help those who are not already acquainted with Wes Montgomery's music. Verve would do well to put some hook on the outside to intrigue browsers to buy the disc. On the inside, some background on Montgomery and his contributions to music might help. Although it's a minor point, most of the track timings given in the booklet are inaccurate, and should be corrected in a future printing.

Steve Birchall

Welcome to the Real World:

Mr. Mister
RCA PCD1-8045.

Even if you try to be informal with these guys and drop all titles, you've still got to call them Mister. Well,

they do deserve a great deal of respect for having created 10 cuts worth

of sometimes sparkling, always sturdy rock. You've undoubtedly heard the standout tunes chosen as singles: The mournful yet defiant "Kyrie," and "Broken Wings,"

with its lovely church choir borrowings. These two are beautifully recorded and shown to good advantage on this Compact Disc.

Mr. Mister has an excellent melodic sense and a driving energy powered by persuasive percussives. The lyrics, on the other hand, vary from brilliant to repetitious and bordering on the banal.

In general, the recording is quite good, with crisp drums, strongly pre-senced guitar work, and substantive keyboards. However, the first few cuts develop a distressing metallic haze that turns cymbals tinny and thin, adds an unnatural sibilance to the vocals, and obscures all sense of depth.

Although flawed, *Welcome to the Real World* is still a worthy addition to your rock CD shelf. Paulette Weiss

Stravinsky: Le Sacre du Printemps, The Symphonies of Wind Instruments. L'Orchestre Symphonique de Montreal, Charles Dutoit. London 414 202-2.

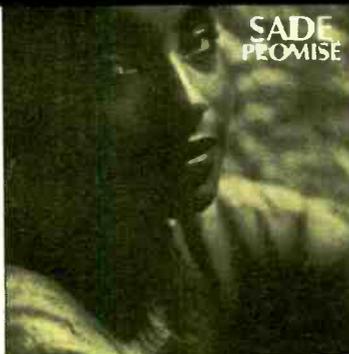
Stravinsky's "Le Sacre du Printemps" (The Rite of Spring) has always been a favorite vehicle for showing off the engineering skills of various record companies. Even this early on in the existence of the CD medium, there are six recordings of this ultradynamic score, and now we have a splendid new version from London/Decca. London is, in fact, competing with itself, for they have already issued an excellent CD recording of "Le Sacre" by Antal Doráti and the Detroit Symphony.

No doubt they felt compelled to record this version because of the huge success of virtually every recording they have made of conductor Charles Dutoit and his Montreal Symphony Orchestra in the renowned acoustics of St. Eustache Church. As I have noted before, Decca engineer John Dunkerley has created an optimum recording setup to take advantage of the wonderfully warm, spacious acoustics afforded by the wood and stone interior of Montreal's St. Eustache. Achieving a well-balanced recording of "Le Sacre," which calls for a very large orchestra and a heavily augmented percussion battery, is no small feat. I well remember the problems I encountered when I recorded this piece with Sir Eugene Goossens and the London Symphony Orchestra. (Incidentally, Sir Eugene conducted the first performance of "Le Sacre" in England in 1913, just after its infamous premiere in Paris, which almost caused a riot! Sir Eugene told me that the British premiere concert was delayed for half an hour while they awaited the arrival of Stravinsky.)

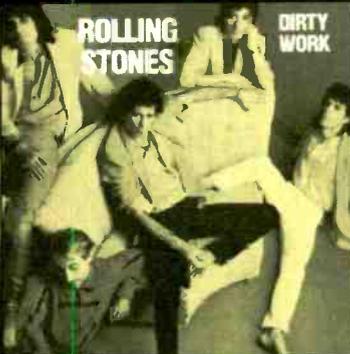
Sonically, John Dunkerley has pro-

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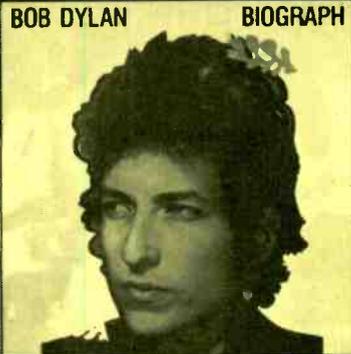
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BIOGRAPH**

8

12



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22

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Eduardo Mata, although a guest conductor, gets exceptionally fine playing from the musicians on the Strauss and Wiren pieces.

vided a recording that manages to cleanly delineate every strand of Stravinsky's incredibly complex and dynamic orchestration, while maintaining a most natural musical perspective. The scoring for percussion is a very vital element in "Le Sacre," and the various sounds of tympani, bass

drums, snare drums, assorted bells, gongs, tam-tams, and cymbals are reproduced here with shattering and explosive impact. There are great brazen sounds from the brass, imperious in their projection. Woodwinds, including Stravinsky's beloved bassoons and bass clarinet, are well focused. Strings

are clean and smooth, with especially sonorous contrabassi.

Dutoit performs "Le Sacre" more in a balletic fashion than as a concert piece, which certainly is a valid approach, since it is indeed a ballet score. Thus, he gives weight to the sensuous as well as the savage elements in it. Nonetheless, this is still a most propulsive reading in which the frenzied rhythms of the final dance, accented by pounding drums and blaring brass, reach a fortissimo climax of orgiastic power.

A stunning achievement. *Bert Whyte*

What has four motors, three heads... and three brains?

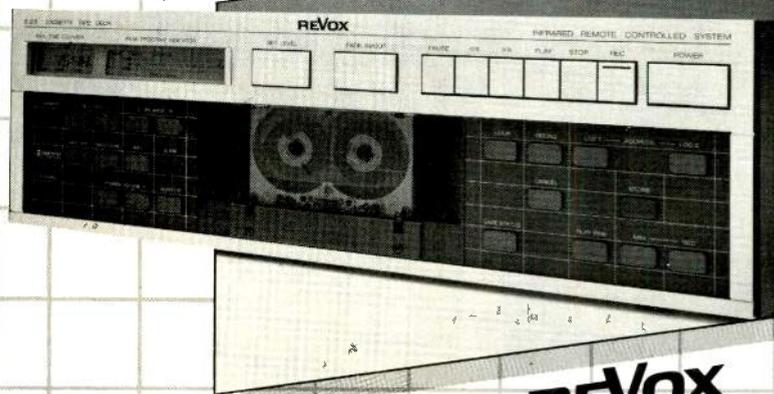
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Richard Strauss: Le Bourgeois Gentilhomme Suite; Dag Wiren: Serenade for String Orchestra. The National Arts Centre Orchestra of Canada, Eduardo Mata.
RCA RCD1-5362.

I have always been fond of the music of Richard Strauss, and have had the pleasure of recording "Don Juan," "Till Eulenspiegel," and "Salome's Dance" with Leopold Stokowski, and his monumental "Ein Heldenleben" with Leopold Ludwig and the London Symphony Orchestra. I also count myself as an admirer of "Der Rosenkavalier" and other great works of Richard Strauss. However, try as I might, I just have never been able to summon much enthusiasm for his suite from "Le Bourgeois Gentilhomme" or for his "Symphonia Domestica." In a word, I find them dull.

They have their devotees, of course, and if you like "Le Bourgeois Gentilhomme," this new CD recording of it is to be recommended as very well done. Eduardo Mata, usually at the helm of the Dallas Symphony Orchestra, conducts the National Arts Centre Orchestra of Canada in a very polished, cohesive performance. Considering that he was a guest conductor, Mata gets exceptionally fine playing from the musicians, especially the high strings.

The good string work is also much in evidence in Dag Wiren's delightful 1937 "Serenade for String Orchestra."

Recorded in the warm acoustics of the National Arts Centre hall in Ottawa, the sound is very clean, the strings are quite smooth, and there is good detail on all other orchestral elements.

Bert Whyte



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Dirty Work: The Rolling Stones
Columbia OC 40250, \$8.98.

Sound: B Performance: A-

This record marks a few changes for that timeless institution of rock 'n' roll, The Rolling Stones. First off, they have left their old record label (Atlantic) for CBS, only the second time they have changed labels in the band's 20-year-plus career. They have also engaged the services of a record producer, that necessary evil that this quintet had lived without since *Goat's Head Soup*. The new producer is Steve Lillywhite, whose work with bands like The Psychedelic Furs, Big Country, U2, and Simple Minds is characterized by dramatic use of reverberation on the drums and guitars.

How have these seemingly major changes affected the way The Rolling Stones make their records? Hardly at all. There are no bagpipe guitars, no drums appreciably different from those on the last few albums, no cleaning up of the characteristically trashy sound. Lillywhite has done his homework and helped Keith, Woody, and Mick fashion a new Rolling Stones album that seems very much in context with the guitar-oriented Stones albums of recent vintage. Cameo appearances by former

providers of source material make things a little more interesting: Jimmy Page (who guested on a few tracks the group recorded in the early and mid-'60s) adds a nasty lick, and background vocals are by Bobby Womack (who wrote The Stones' first big American hit, "It's All Over Now") and Don Covay (who penned "Have Mercy").

So is this an R&B album or what? Actually, there is one authentic soul tune ("The Harlem Shuffle"), but apparently this is the record Keith Richards and Ron Wood were writing while Mick was doing his solo album. Meaning that there's little of Mick's mid-tempo stuff to interfere with the more degenerate side of the group.

Make no mistake, this is a guitar album. Unlike *She's the Boss*, Mick's amalgamation of current trends, *Dirty Work* stands true to The Rolling Stones' tradition of layer upon layer of filthy, gutsy electric guitars, with little concern for clean technical execution. At least, they keep their axes in tune. Not your generic power-chord guitars, these are greasy, jagged-edge guitars without any polish. Lillywhite has kept them meaty but given them enough clarity so that, in this symphony of six-strings, each can be individually heard rather than lost in a wall of clang.

Jagger's contribution was in most cases as a singer only, not as the director/songwriter/persona-in-charge. And remember, Mick is only one of several singers here. The company he keeps (Covay and Womack) can easily outsing him if he falters. Jagger's energies are focused upon his performance, not on songwriting, and it creates the edge that makes The Stones more interesting than they've been in some time.

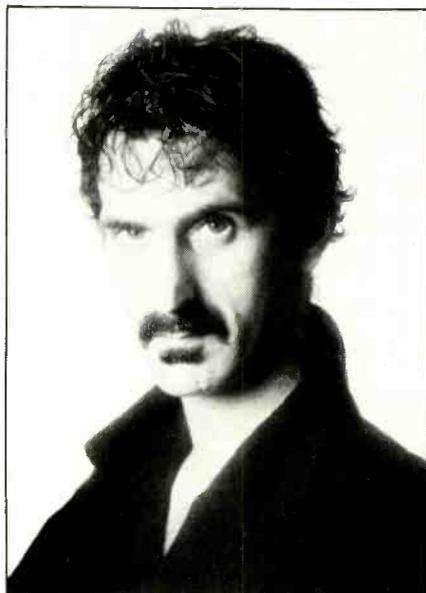
Is it exciting? Is it a "hit"? Any Rolling Stones fan knows better than to expect the group to hit the heights they reached in their pre-Atlantic days, but there is enough satisfaction in knowing that they've managed to make a gutsy LP à la *Some Girls*. Alas, the yardstick they set for themselves in the '60s has to be bent a bit for their more recent records, but in this diminished world a new Rolling Stones record, with as much edge as *Dirty Work*, should not go unappreciated. *Jon & Sally Tiven*

Frank Zappa Meets The Mothers of Prevention

Barking Pumpkin ST-74203, digital, \$8.98.

Sound: B+ Performance: B+

Words and music as honest and insightful as Frank Zappa's are rare, and when he isn't being gratuitously disgusting and adolescent, he can be pretty funny too.



To be found on this album are four different species of composition. "We're Turning Again" and "Yo Cats" combine intelligently arranged (if insubstantial) music with humorous, perceptive observations about out-of-date hippies and sold-out, money-grubbing session players, respectively.

"Alien Orifice" and "What's New in Baltimore" are avant-garde, jazzy instrumentals with subtly and attractively contoured melodies. Zappa beautifully doubles and triples these melodies with instruments that combine to produce exciting and sometimes startling textures; for example, he pairs a soaring, legato lead guitar with the rapidly beating bell-tone of a xylophone.

"Porn Wars" is a *musique-concrète* sound collage. Synthesized 20th-century dissonance provides the ominous setting for a damning collection of tape snippets of the Congressional hearings on "porn rock." The snippets are sped up, slowed down, distorted, multiplied, processed and looped.

"Little Beige Sambo" and "Aerobics in Bondage" are samples of Zappa's "serious" atonal music. The first consists of rapid, swirling, scalar runs in lovely clear tones, and the second proceeds in angular fits and starts. Here, as everywhere on the album, superb digital recording renders crisp and clear a wide range of synthesized, electric, and acoustic sounds.

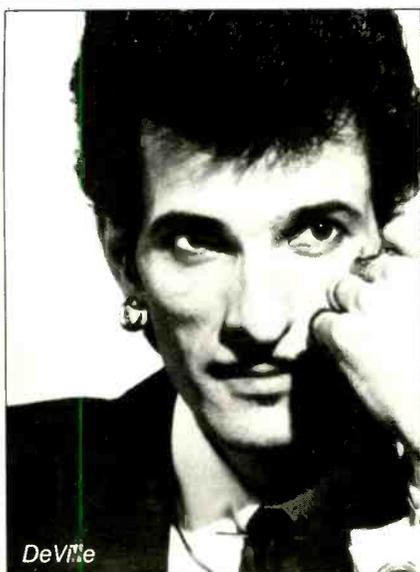
Susan Borey

Sportin' Life: Mink DeVille
Atlantic 81623-1, \$8.98.

Sound: C+ Performance: C+

Mink DeVille is what happens when people don't appreciate Southside Johnny and the Jukes. *Sportin' Life* isn't bad, it's just without personality; bandleader and coproducer Willy DeVille has a voice, but not a voice. Know what I mean?

Part of the problem is the production. DeVille lets his band play around with Spanish Harlem percussion and classic Atlantic Records chord constructions, and then for some reason mutes the mix—no crashes, no booms. The ballad "I Must Be Dreaming" and the romantic soliloquy "In the Heart of the City" ache to be let loose. Tepid tempos work against them, and turning up the volume doesn't help.



DeVillie

DeVillie does get playfully rambunctious on songs like "Italian Shoes" and the jump-blues tune "Little by Little," and his cover of the oldie "There's No Living (Without Your Love)" trips straight into the heart of R&B; it sways like a lover against a lamppost, calling out to the lady in the moon. *Sportin' Life* is '80s doo-wop. You could do worse. Willy DeVille could do better.

Frank Lovece

John Lennon Live in New York City
Capitol 4XV-12451, \$9.98.

Sound: D- Performance: B

It's hard to believe that this concert album was recorded, even in 1972, with release in mind. Even 14 years ago, in darker ages of recording technology, people were able to achieve sound quality one could live with; in this case, it's painful to even visit. It's great to hear our hero in a feisty, Aquarian mood—the concerts were benefits for handicapped children—but serious problems obscure much of what's good here.

The worst sonic attributes of Madison Square Garden (or any sports arena) are preserved for posterity on this recording. The sound is incredibly boomy and noisy, causing percussion to sound like it's been performed on a set of trash cans and bass guitar to mimic acute intestinal distress. The most shameful trick the distortion plays here is to nearly ruin the sound of Lennon's voice. On the medium-intensity tunes, such as "Give Peace a Chance," he sounds more like Neil Young. Thankfully, on the quieter numbers, where the band backs off, and on the stompers, where he screams over them, Lennon's elasticity and



Though strong vocals are at the center of Nena's power-pop music, what makes this album special is the songs' substantive subject matter.



Nena Kerner

strength make their way through the murky mess.

The barely rehearsed backup band provides a musical setting Lennon seems quite at home with. With Claptonesque guitar, a horn section, and busier-than-Ringo drumming, they spotlight his bluesier side. Many songs, including "Come Together," have a tough tone that makes McCartney's mawkish pop influence on The Beatles ever more evident. Although they are often ragged, the band deserves kudos for saving one of the album's gems. After Lennon begins "Imagine" on piano much too quickly, the band jumps in and successfully struggles to slow him down.

Mainly political, post-Beatles fare, the 11 songs are powerful, but by no means a classic collection for Fab Four fans stuck on Lennon's lighter side. And with so much of the excitement of live performance dampened by poor sound quality, this record can be recommended only to those who can overlook a lot in order to catch a fascinating moment in rock history.

Susan Borey

Gladys' Leap: Fairport Convention
Varrick VR-023, digital, \$9.49.

Sound: B+ Performance: B+

The first Fairport Convention album in years is a bracing collection that is as invigorating as a cool, clear, country breeze.

This time around, Fairport is basically an augmented trio consisting of long-term Fairporters Simon Nicol, Dave Pegg, and Dave Mattacks. Ric Sanders adds fiddle to two of the songs; on another, charter Fairporter

Richard Thompson adds his trademark guitar.

The songs are an eloquent lot with a common thread of narrative storytelling. Nicol and Pegg split lead vocal chores, and several cuts reveal unsuspected power in Nicol's singing. Cathy Lesurf is guest vocalist in the tradition of the late Sandy Denny for her own "My Feet Are Set for Dancing."

The execution of the songs is often surprisingly modern, especially Dave Pegg's contributions on bass, mandolin, and bouzouki. His lines venture beyond foundation to add a very special voice to the mix. The sound is excellent; crystal clarity is buoyed by digital mastering to yield a sturdy, muscular sound. The delicate passages meld with powerful ones effectively, and the moments of silence in the songs are really silent.

Not the same Fairport Convention of yore, ace fiddler David Swarbrick is conspicuously absent, but not missed—such is the strength of the new album. A worthy and excellent addition to a big legacy, *Gladys' Leap*, quite surprisingly, is one of the most solid Fairport Convention albums ever.

Michael Tearson

It's All in the Game: Nena
Epic FE 40144/BL 40144.

Sound: B Performance: B-

On initial listen, this second American album from the West German group Nena throws a spray that might have come from the good ship Abba. Only on initial listen, though. Just as on the band's surprise hit a couple summers back ("99 Red Balloons"), lead singer Gabrielle "Nena" Kerner does not know from sweet. And though her strong vocals form this power-pop band's centerpiece, initial comparisons to Pat Benatar miss the mark as well: Kerner also doesn't know from tough.

What makes this album special is that Kerner is singing about substantive things. (She's fluent in English too, and it shows.) Having already addressed nuclear war—with a beat, yet—on 99 *Luftballons*, Nena here turns its collective attention to comfortably complacent relationships ("Are

You Awake?"), stereotypes about the German people ("Utopia"), and, in the title track, existential game plans. Just when it all seems a mite technocratic, Nena lets out with "You Don't Know What Love Is," a jaunty singsong with a silly "na na na" chorus that's as wonderfully apt—in a lighthearted way—as Gene Vincent's "be-bop-a-lula."

I think Nena is getting warmer by the minute.

Frank Lovece

The Wishing Chair: 10,000 Maniacs
Elektra 9 60428-1, \$8.98.

Sound: C Performance: B

Reversing the process that began when working-class Englishmen interpreted American blues, 10,000 Maniacs has delivered the most promising debut album to ever reflect British folk music as seen from this side of the Atlantic. With its catalog of lilting Celtic sounds, *The Wishing Chair* is skillfully derivative, but full of enough other international influences to escape a traditional folk slotting.

Producer Joe Boyd, who helped electrify the folk-anchored Fairport Convention, gets the same kind of clean, grandly solid sound from the Maniacs. Evenly strummed acoustic and electric guitars generally have equal intensity in the mix; percussion only hints at pulse. Traditional accessories such as mandolin, pedal steel, and accordion come and go like buskers. The producer and instrumentalists don't take many chances; their sure but subdued styles bare the stage for the band's main attraction, the voice of Natalie Merchant.

Perhaps Merchant's singing is so pleasing because it's hard to fathom. She's both mature and girlish, restrained and abandoned, earthy and unearthly. The same can be said of Merchant's lyrics, which, with commendable poetry and breadth of vision, give this band's music a unique sheen. Unfortunately, unless you follow along with the lyric sheet, the poetry is obscured by Merchant's elliptical phrasing and adopted English accent. Such calculated mystifying undermines her precocity. With so much to say and an obvious knack for verbal portraiture, a peep-show approach seems both manipulative and wasteful.

Susan Borey

FAIRPORT CONVENTION



TELARC

THE HIGHEST STATE OF THE NEWEST ART

Solo at Midnight: Mike Cross Sugar Hill SH-1007.

Sound: B- Performance: A-

Perhaps it's the little anecdotes? The reassuring melodies? Nostalgia? Whatever the reason, it's no coincidence that, as more Americans tune in to the droll world of Lake Wobegon, there's been a renaissance of acoustic music fostered by a host of small indie labels such as the prolific Sugar Hill Records (P.O. Box 4040, Duke Station, Durham, N.C. 27706).

A fine example of this trend is *Solo at Midnight*, the latest offering by talented multi-instrumentalist Mike Cross. Shifting gears from his previous, Nashville-style ensemble music, *Solo at Midnight* features Cross solo, singing and playing six- and twelve-string guitars, fiddle, and banjo in a well-balanced, nicely paced program of traditional and self-penned tunes.

The blood gets flowing right off, with the rousing "Appalachian Mountain Boogie" backed by some very hot guitar pickin'. Also, check out the a cappella "Dear Boss," a hilarious, it's-been-one-of-those-days account of a losing battle with a barrel of bricks. For steaming twelve-string à la Kottke, try the instrumental "Rusty Waterwheel." Some nifty slide-guitar train effects propel the driving "Panama Limited" to re-create the lonesome fast freight.

Cross' strong, slightly nasal voice has a pleasing texture well suited to this style of music, and is convincingly showcased on the gentle, plaintive ballads "Fare Thee Well, Marianne" and "He Is Everywhere."

If there's a flaw to this recording, it lies in the unevenness of the production, undertaken by Cross himself. While each individual cut tends to be crisp and clean, the songs keep changing aural perspective, which can be disorienting as you move through the LP. Too much reverb with a distant "cathedral" sound on the opening cut shifts to a direct, up-front sound on the second, and so forth.

Still, the spirited performance and excellent programming overshadow any minor production quibbles. If you enjoy the intimacy of music in the folk vein, or if you like a mighty fine picker, *Solo at Midnight* will bring you pleasure.

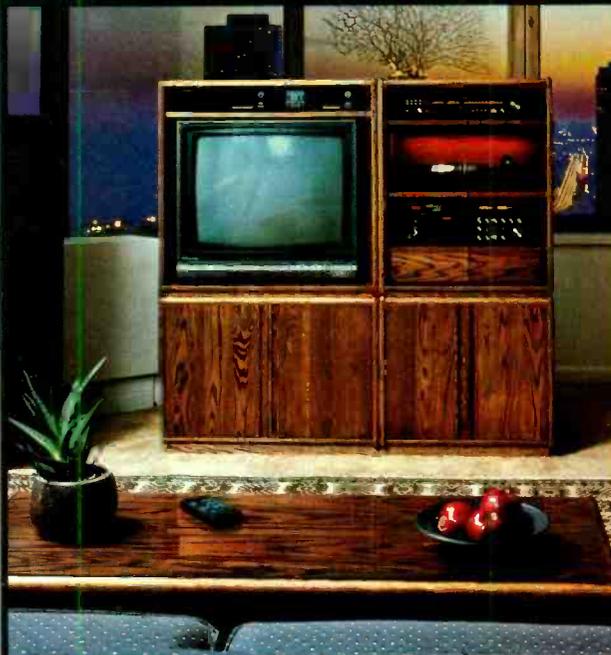
Michael Wright



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Renaissance Favorites. Waverly Consort; Michael Jaffee, director.
CBS IM 37845, digital.

The record world is worldwide, but New York—though not exactly the hub of the universe—seems to live in its own cosmos. Thus, somehow or other, New York musical ensembles tend to sound like New York when you hear them on records.

The Manhattanisms are often held in check on this disc, but not always. Often, the six Waverly voices blend beautifully into clear harmonies, alone or with their "ancient" instrumental accompaniment. Just as often, the familiar New York-based voices edge forward, loud and punchy, to fill large spaces and grab at restless audiences. This doesn't go well on recordings. The punchiness is hard on the electronics, and the sudden volume is bad for blend. In the same way, there are moments when the words come through exquisitely, but as many where phrasing of the text is more noisy than subtle, the words lost in the vocal projection, or in the extra fast or super slow tempi, the big ritardandos at the ends, which do help with stage dramatics. New York audiences expect a lot of brilliance and contrast.

As soloists with accompaniment, these voices can excel. Together they are able to sing as an ensemble—try

the long-familiar "Mon coeur se recommande à vous," now de-ranked from Lassus to Anonymous (but still lovely!), or Hassler's "Ach weh dess leiden," both full of pathos and beautifully projected. But Gibbons' "The Silver Swan" is dismally slow and without phrasing or word shaping. Le Jeune's "Revecy venir du Printans" races like an overworked ticker tape, syncopated as surely was never the intent. But the program is lively, and the whistling, plucking and tooting instruments are well played and pleasingly recorded—even the difficult recorder, which produces murderous peaks in the electronic midrange.

The program notes by the brilliant (if eccentric) Richard Taruskin are startling to read. Anglophiles will not be happy to hear, for instance, that familiar works such as "Now Is the Month of Maying" and "My Bonnie Lass She Smileth" by Thomas Morley are no more than piracies, or that his "First Book of Ballets" as a whole is "a set of out-and-out plagiarisms." Wow! The great Josquin Des Prez, Taruskin says, was largely great because he was the first to benefit from the new art of music printing and distribution. Even so, that composer is still big, as I hear him. But technology, even then, does make the man. Stimulating guy, this Taruskin. I would buy this record just for the notes, even minus a record player.

Music for Two Guitars: Sergio and Odair Assad.

Nonesuch 79116, digital, \$11.98.

These two young Latin American "classical" guitarists, identical twins by the look of it, actually bring to the North a whole new way of guitar playing, though it would seem to be familiar enough in their home territory. Our own guitar players, of any type, will be amazed. It is a new sound, compounded of contemporary guitar, modern jazz, and Latin American rhythms and tunes of many kinds. The technique is fabulous—I could not believe that so many notes could issue so fast from the familiar acoustic instrument, or even two of them. Reminds me of certain mod-jazz pianists, the sort who sometimes play in clubs or fancy restaurants, weaving elaborate patterns and rich chromatic harmonies—but these are fingers on frets and strings, not keys. The piano is easier.

I will have to admit, though, that even with a variety of Latin American composers represented—young and old, and including one of the players—the sound is too much the same. Close study of the music, with the aid of the very scholarly notes, would no doubt bring out the differences, but to a casual musical ear there isn't much contrast. I liked best of all the very simplest set of pieces, the first on side one, a group of tangos. After that, amazing or not, it becomes a surfeit of notes. Too many! Unless, of course, you play the guitar yourself.



Illustration: Rick Tulka

Music of Turlough O'Carolan, Celtic Harp Vol. 1; From a Distant Time, Celtic Harp Vol. 2. Patrick Ball. **Fortuna LP FOR005, LP FOR011.** (Available from Fortuna Records, P.O. Box 1116, Novato, Cal. 94947.)

This Celtic bard locates himself in California and so does his record company, which perhaps says a bit about this novel form of the Old Irish. Authentic folk collectors have been doing much with the more familiar Irish harp; the instrument played here is evidently an earlier type, with all-wire strings, said to have become a "lost art" around two centuries ago. Patrick Ball, then, necessarily re-creates his own Irish tradition to an extent, determined in part by the nature of the instrument, which has a plain diatonic scale (no sharps or flats) and thus plays pretty much in one key, so to speak. My ear tells me that most of the "modal" harmonies—lots of minor chords—which Ball uses in his liquid arpeggios are his own. California folk style, to a degree, and not very Celtic.

Yet the instrument has a lovely sound (this one was made recently in Maine) and the tunes are the familiar Irish sort, a lot of them not genuine folk music but more in the nature of popular songs, very catchy and melodious. The Londonderry Air, of course—who doesn't know that one? And more of the like, plus a lot that will sound familiar even if you don't know them. Patrick Ball plays the tunes clearly, surrounding them with a flowing background. If you don't mind his harmonic style (I do), you will find the whole thing very pleasing and peacefully lulling.

The Celtic harp sound is indeed interesting, somewhat like a large music box (with its blurring-together of tones) droning away. The brass strings are played with fingernails, not plucked softly as in other harp music. The treble is shiny and velvety in tone, and the bass, not often used, is a really gentlemanly boom, surprisingly forceful. The Celtic harp grows on you. And it records beautifully.

As is the norm today among small LP outfits, the sound here is uniformly excellent, the surfaces unusually smooth and quiet for LP. You won't find this material on CD, but it is alternatively available in cassette format.

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12th ANNUAL CAR STEREO DIRECTORY

Last year there were too few CD players to mention; this year's Directory has 25, plus 1,846 other models—391 more than last year, even though we're not currently listing crossovers. Other signs of the times: Extractability to foil theft and more units with AM stereo. All data was provided by the manufacturers, and edited with the assistance of Bill Kirkpatrick.



AMPS/EQUALIZERS

MANUFACTURER	Model	Price, \$	Preamp (P), Amp (A), Equalizer (E)	Number of EQ Bands	Boost/Cut Range, ± dB	S/N Ratio, dB	Watts Channel Into 4 Ohms, per IEC RS-490	Power Bandwidth, Hz to kHz, per IEC RS-490	THD at Rated Output, % per IEC RS-490	Input Levels: Preamp (P), Selectable (Sel.); Adjustable (Adj.)	Fader Control?	Application Guides Available?	Dimensions, inches	Notes
ADS	P40	190.00	A			87	20	20-20	0.05	Sel.	No	No	7 7/8 x 1 5/8 x 5 5/8	Bridgeable.
	P80	290.00	A			90	40	20-20	0.1	Sel.	No	No	11 1/4 x 2 1/2 x 6 1/2	As above.
	P120	370.00	A			90	60	20-20	0.1	Sel.	No	No	11 1/4 x 2 1/2 x 6 1/2	As above.
ALPHASDNK	A-2125	450.00	A			98	125	20-20	0.01	Sel.	No	No	2 1/2 x 8 x 14 1/4	Class A.
	A-2075	375.00	A			98	75	20-20	0.01	Sel.	No	No	2 1/2 x 7 1/2 x 11 1/4	As above.
	A-2055	250.00	A			90	55	20-20	0.05	Sel.	No	No	2 1/2 x 7 1/2 x 10	
	A-2040	175.00	A			90	40	20-20	0.05	Sel.	No	No	2 1/2 x 7 1/2 x 7 1/2	
	A-2025	125.00	A			90	25	20-20	0.05	Sel.	No	No	2 1/2 x 7 1/2 x 5 1/2	
	A-4018	90.00	A			75	18 x 4		0.1	Sel.	No	No	1 1/2 x 5 1/2 x 6 3/8	
	A-2018	55.00	A			75	18		0.1	Sel.	No	No	1 1/4 x 4 x 4 3/4	
	P-1	230.00	P/E	4	12	85			0.01	P	Yes	No	1 7/8 x 7 x 3 1/2	
	PEQ-7	100.00	P/E	7	12	80			0.02	Sel.	Yes	No	1 7/8 x 6 x 4 1/4	
	AEQ-72CB	150.00	P/A/E	7	12	75	20†	10-100	1	Sel.	Yes	No	1 7/8 x 6 x 4 1/4	†Speaker level outputs on front channel, preamp level outputs on rear. Includes 160-Hz crossover; for subwoofer.
	AS-110G	250.00	A			90	100 x 1	15-160 Hz	0.05	Sel.	No	No	2 x 6 1/2 x 8	As above but 150-Hz crossover.
AS-106G	145.00	A			90	60 x 1	15-150 Hz	0.05	Sel.	No	No	2 x 6 3/8 x 8		
ALPINE	3537	400.00	A							Adj.	No	Yes	11 3/4 x 2 1/2 x 7 1/2	Bridgeable, 2/4-ohm speaker impedance selector.
	3530	380.00	A							No	Yes	11 3/4 x 2 1/2 x 7 1/2	As above, 4-channel.	
	3533	330.00	A			100	60	20-20	0.08	Adj.	No	Yes	11 3/4 x 2 x 6 3/4	Bridgeable, impedance selector as above.
	3521	250.00	A			105	50	20-20	0.08	Adj.	No	Yes	9 3/4 x 2 1/2 x 6 1/4	Impedance selector as above.
	3520	250.00	A			103	120 x 1	20-20	0.08	Adj.	No	Yes	9 3/4 x 2 1/2 x 6 1/4	Input selector for L/R/L + R.
	3519	180.00	A			105	30	20-20	0.08	Adj.	No	Yes	9 3/4 x 2 1/2 x 5 1/2	Impedance selector as above.
	3510	110.00	A			90	13 x 4	30-20	0.8	Adj.	No	Yes	7 1/2 x 1 1/2 x 4 1/4	
	3505	70.00	A			90	13	30-20	0.8	Sel.	No	Yes	5 7/8 x 1 1/2 x 2 3/4	
	3211	130.00	P/A			80	13	40-120 Hz	0.8	P	No	Yes	7 x 1 x 5 1/4	Subwoofer amp; includes active crossover; subwoofer phase control and on/off switch.
	3215	230.00	A/E	7	†	80	13 x 4	40-20	0.8	Sel.	Yes	Yes	7 x 1 x 5 1/4	†At 60, 125 and 250 Hz, ±18 dB; at 500 Hz, 1 kHz, 3.5 kHz and 10 kHz, ±12 dB. Preamp and speaker outputs.
	3213	170.00	P/A/E	7	†	80	13	30-20	0.8	Sel.	Yes	Yes	7 x 1 x 5 1/4	
3210	110.00	A/E	7	12	75	8	30-20	0.8	Sel.	Yes	Yes	7 x 1 x 5 1/4		
(Continued)	3317	300.00	P/E	7	12					P	Yes	Yes		Spectrum analyzer; four memory presets.

Photograph: ©1986, Bill Ashe

AMPS/EQUALIZERS

MANUFACTURER	Model	Price, \$	Preamp (P), Amp (A), Equalizer (E)	Number of EQ Bands	Bass/Cut Range, ±dB	S/N Ratio, dB	Watts/Channel into 8 Ohms, per EIA RS-450	Power Bandwidth, Hz to kHz, per EIA RS-450	THD at Rated Output, % per EIA RS-450	Input Levels: Preamp (P), Speaker (S), Selectable (Sel.), Adjustable (Adj.)	Fader Control?	Application Guide Available?	Dimensions, inches	Notes
ALPINE (Continued)	3318	420.00	P/E	7	†	95				Sel.	Yes	Yes	7 x 1 x 5½	As above; front/rear selector; includes active crossover.
	3311	200.00	P/E	7	†	100				P	Yes	Yes	7 x 1 x 4¾	
AMERICAN AUDIO	DPB-777SS DPB-787W		A/E A/E	7 10	12 12	70 80	30 x 4 50 x 4	20-20 20-20	0.1 0.15	Sel. Sel.	Yes Yes	No No	6½ x 7½ x 5½ 7½ x 1¼ x 6½	Front and rear independently controllable.
AR	GCS 80/40	329.95	A			100	80 x 2, 40 x 4	10-50	0.2	P	No	No	10½ x 2½ x 8½	
A.R.A.	PEQ-100	89.95	P/E	6	10	70			0.15	Sel.	Yes	No		
	PEQ-200	129.95	P/E	7	10	70			0.22	Sel.	Yes	No		
	PEQ-500	64.95	A/E	7	10	70	12		1.0	Sel.	Yes	No		
	PA-200	99.95	A			85	15 x 4	30-20	1.0	Sel.	No	No		
	PA-400	39.95	A			85	15	20-20	1.0	Sel.	No	No		
ARI SYSTEMS	PA-225	169.00	A			94	25	20-30	0.01	Sel.		Yes	8 x 8¼ x 2	Bridgeable. As above. As above. As above. As above.
	PA-245	229.00	A			94	45	20-30	0.01	Sel.		Yes	8 x 2 x 8¼	
	PA-275	329.00	A			94	75	10-40	0.02	Sel.		Yes	9 x 2 x 8¼	
	PA-445	429.00	A			94	45 x 4	20-30	0.03	Sel.	Yes	Yes	19 x 8¼ x 2	
	PA-475	529.00	A			94	75 x 4	10-40	0.02	Sel.	Yes	Yes	21 x 8 x 2	
AUDIO CONTROL	EQX	299.00	P/E	12	18	110			0.005	Sel.		Yes	2¼ x 9½ x 6¾	Includes active crossover and bridging adaptor.
	EQL	189.00	P/E	12	18	110			0.005	Sel.		Yes	1½ x 9½ x 6¾	Includes active crossover and subsonic filter.
	2XS	99.00	P		12	119			0.005	Sel.		Yes	1½ x 5½ x 4½	
AUDIOMOBILE	SA-452	290.00	P/A			110	40†	20-20	0.05	Sel.	Yes		4¾ x 6½ x 2	†into 2 ohms. Feedforward, nonswitching amp.
	SA-1200	490.00	P/A			110	40 x 2, 20 x 2†	20-20	0.05	Sel.	Yes		4¾ x 15½ x 2	As above; includes active crossover.
	SA-1600	550.00	P/A			110	40 x 2, 20 x 4†	20-20	0.05	Sel.	Yes		4¾ x 15½ x 2	As above.
	SP-300 System 1600	290.00 1090.00	P/E P/A	3	15	90 110	40 x 2, 20 x 4†	20-20	0.05 0.05	Sel. Sel.	Yes Yes		4½ x 1½ x 4 4¾ x 15½ x 2	Includes four satellites, two subwoofers, and SA-1600.
	System 1200	790.00	P/A			110	40 x 2, 20 x 2†	20-20	0.05	Sel.	Yes		4¾ x 15½ x 2	Includes two satellites, two subwoofers, and SA-1200.
AUDIVOX	Amp 500	28.00	A	5	12	75	12.5	20-30	1	S	No		4¾ x 1¼ x 5	Floating ground compatible. As above. As above. As above. As above.
	Amp 555	42.00	A/E	5	12	75	12.5	20-30	1	S	Yes		4 x 1 x 5½	
	Amp 575	60.00	A/E	5	12	75	12.5	20-30	1	S	Yes		4 x 1 x 5½	
	Amp 775	72.00	A/E	7	12	75	12.5	20-30	1	S	Yes		4¾ x 1 x 5½	
	Amp 785	100.00	A/E	7	12	75	12.5	20-30	1	S	Yes		6¼ x 1¼ x 5½	
AUTOTEK	A-160	59.95	A			65	18	20-20	1	P	No	No	1 x 5 x 6	Bridgeable. As above.
	A-180	145.95	A			90	40	20-20	0.5	S	No	No	3 x 6 x 6	
	A-230	199.00	A			90	65	20-20	0.5	S	No	No	3 x 6 x 7	
AUTOVOX	AX 220	93.60	A			70	13	20-20	1	Sel.	No	Yes	2 x 6½ x 3½	±20 dB at 60 Hz.
	AX 240	168.50	A			70	30	30-20	1	Sel.	No	Yes	2 x 6½ x 8	
BGW SYSTEMS	600B	299.00	A			80	50	20-20	0.1	Sel.	No	No	3¾ x 7½ x 5½	±20 dB at 60 Hz.
	602B	369.00	A			80	75	20-20	0.1	Sel.	No	No	3¼ x 7½ x 5¾	
	302B	229.00	P/E	3	12	74			0.05	Sel.	No	No	1¾ x 4¾ x 3½	
BLAUPUNKT	BEQ-MS	99.95	E	5	12	80				Sel.	Yes	Yes	3.6 x 1.3 x 2.4	Stalk-mounted. Front and rear EQ.
	BEQ-80	139.95	E	7	12	80				Sel.	Yes	Yes	5.6 x 1.8 x 6	
	BEQ-65	189.95	E	5	12	80				Sel.	Yes	Yes	5.6 x 1.5 x 5.8	
	BEQ-FR	179.95	E	9	12	80				Sel.	Yes	Yes	5.6 x 1.9 x 6	
	BEA-40	129.95	A/E	5	12	80	20	20-20		Sel.	Yes	Yes	5.6 x 1.5 x 5.8	
	BEA-80	179.95	A/E	7	12	80	20 x 4	20-20		Sel.	Yes	Yes	5.6 x 1.8 x 6	
	BPA-415A	109.95	A			87	8 x 4	40-20	1	P	No	Yes	5.2 x 1.6 x 6.4	
	BPA-430	279.95	A			90	30 x 4	10-30	1	P	No	Yes	7.2 x 2.3 x 10.6	
	BPA-260	279.95	A			90	60	10-30	1	P	No	Yes	7.2 x 2.3 x 10.6	
	BOSE	1201 Deck Mount	349.00	A/E	†	†	70	25††	40-17	0.20	Sel.	No	No	
1201 Door Mount		299.00	A/E	†	†	70	25††	40-17	0.20	Sel.	No	No	10 x 5 x 2½	Includes two 4½-inch Direct/Reflecting speakers; compressor as above.
1401 Large Vehicle		549.00	A/E	†	†	70	25 x 4††	40-17	0.09	Sel.	Yes	No	1¾ x 8½ x 5¾	Includes two 4½-inch and two 6 x 9-inch Direct/Reflecting speakers.
1401 Small Vehicle		495.00	A/E	†	†	70	25 x 4††	40-17	0.09	Sel.	Yes	No	1¾ x 8½ x 5¾	Includes four 4½-inch Direct/Reflecting speakers.
CARVER	M-240	350.00	A			100	120	20-20	0.15	Sel.	No		2.3 x 12.5 x 6	Includes active crossover.
CERWIN-VEGA	DB-10C	44.95	E	1	10	85			0.025	P			7 x 3½ x 3¼	Includes subsonic filter; +10 dB boost switch.
CLARION (Continued)	900EQA	279.95	P/A/E	9	12	75	12.5 x 4	20-20	1.0	Sel.	Yes	No	7½ x 1½ x 5½	Includes active crossover. Fader-controlled preamp output. As above. Includes spectrum analyzer. Passive EQ.
	700EQA	199.95	P/A/E	7	12	75	12.5	20-20	1.0	Sel.	Yes	No	6¼ x 1½ x 5½	
	500EQA	139.95	P/A/E	5	12	75	12.5	20-20	1.0	Sel.	Yes	No	5½ x 1½ x 5½	
	280EQB	239.95	P/A/E	7	12	75	12.5	20-20	1.0	Sel.	Yes	No	6¼ x 1½ x 5½	
	100EQB-5	99.95	A/E	5	12	75	12.5	20-20	1.0	S	Yes	No	5½ x 1½ x 5½	
	50EQ	99.95	P/E	5	12	75			0.5	Sel.	Yes	No	5½ x 1½ x 4¼	



GOOD NEWS TRAVELS FAST.

People talk, when there's something worth talking about. Like Aiwa. And Aiwa's new Avimax 8 camera-recorder. A small idea that's getting a lot of attention. What's the big deal? This new tiny 8mm video cassette for starters. It's less than half the size of a VHS cassette. Aiwa's new Avimax 8 camera-recorder gives you all the dramatic performance capabilities of the new 8mm video format. The videotape that's fast becoming the worldwide video standard. Over 100 companies are already behind it. And it's no wonder. Up to 2 hours of high-resolution recording can now fit on a video cassette as small as an audio cassette. Which brings us to sound. Remember, this Avimax 8 camera-recorder is an Aiwa. For those who love technical audio specs, here's one your neighbors will hate. Aiwa's AFM sound recording system gives you an astonishing 85dB S/N ratio! That's second only to the sound quality of the compact disc. What's more, with the optional 181-channel Tuner/Timer, it can all be activated by the Aiwa 10-key Remote Commander. Even the 3-week/4-event program timer. Now let's focus on Aiwa's amazing new CCD image sensor. It lets you be sure that when you shoot, what you shoot will come out bright and clear, just like you see it in the electronic viewfinder, without the image lag or burnout you get with conventional pickup tubes. Combine the CCD image sensor's extra-low-light sensitivity with Aiwa's 6:1 ratio fl. 4 power zoom lens and even Cecil B. DeMille gets envious. The amazing new Aiwa Avimax 8mm camera-recorder—it's portable video's open, and shut case.



AMPS/EQUALIZERS

MANUFACTURER	Model	Price, \$	Preamp (P), Amp (A), Equalizer (E)	Number of EQ Bands	Booster/Cut Range, ±dB	S/N Ratio, dB	Watts/Channel into 4 Ohms, per ELA, RS-400	Power Bandwidth, Hz to kHz, per ELA, RS-400	THD at Rated Output, %	Input Levels, Presamp (P), Speaker (S), Selectable (Sel.), Adjustable (Adj.)	Fader Control?	Application Guide Available?	Dimensions, Inches	Notes	
CLARION (Continued)	1300A	219.95	A		75	45	20-20	1.0	1.0	Sel.	No	No	7 1/2 x 2 x 9 1/2		
	80DA-111	139.95	A		75	13.5 x 4	20-20	1.0	1.0	Sel.	No	No	5 1/2 x 1 1/2 x 6 3/8		
	40DA-111	79.95	A		75	13.5	20-20	1.0	1.0	Sel.	No	No	4 3/4 x 1 1/2 x 6 3/8		
CONCORD	HPA-71	249.95	A		90	70	20-20	0.5	0.05	Sel.	No	No	9 x 8 x 3 1/2		
	HPA-54	249.95	A		80	35 x 4	20-20	0.5	0.05	Sel.	No	No	9 x 6 3/4 x 2 7/8		
	HPA-51	149.95	A		86	50	20-20	0.5	0.5	Sel.	No	No	8 3/4 x 6 1/4 x 2 5/8		
	HPA-26	99.95	A		86	18	30-20	0.8	0.8	P	No	No	5 1/2 x 4 x 1 3/4		
COUSTIC	AMP 100	59.95	A		90	25	30-30	0.9	0.9	Sel.			1 3/4 x 5 1/2 x 6 1/8	Floating ground. As above; bridgeable. As above.	
	AMP 190	179.95	A		92	35	20-20	0.05	0.05	Sel.			2 3/8 x 7 7/8 x 9 1/2		
	AMP 380	279.95	A		92	75	20-20	0.05	0.05	Sel.			2 3/8 x 7 7/8 x 13 1/2		
	EQ-1010	199.95	A/E	7	12	65	25	30-30	0.9	0.9	Sel.	Yes		5 3/4 x 1 5/8 x 5 3/8	Floating ground; CD/AUX input. dbx NR decoding.
	EQ-1020	249.95	A/E	7	12	92	12 x 2, 25 x 2	30-30	0.9	0.9	Sel.	Yes		5 3/4 x 1 5/8 x 6 3/8	
	EQ-1030	299.95	P/E	7	12	92			0.02	0.02	P	Yes		2 x 6 7/8 x 8 1/4	
AMP 120	119.95	A			92	30	20-20	0.05	0.05	Sel.			2 3/8 x 7 7/8 x 7 1/4	Detachable active crossover; includes real-time analyzer.	
CRAIG	V506		A/E	5	12	65	12	20-20	0.5	S	Yes	No	3 5/8 x 1 1/4 x 5 1/2		
	V507A		A/E	7	12	80	15	20-20	0.5	S	Yes	No	5 7/8 x 1 1/4 x 5 3/4		
CYBERNET	CMS 3050	336.00	A/E	5	10	80	65	50-50	10	P	No	No	7 1/2 x 3 x 11 3/8		
DENON	DCE2150	160.00	E	7	12	90	12	20-20	0.5	P	Yes	No	7 1/2 x 1 1/4 x 5 3/4	Includes active crossover.	
	DCA3100	100.00	A			90	12	20-20	0.5	P		No	6 x 1 1/4 x 7		
	DCA3175	180.00	A			95	30	20-20	0.05	P		No	8 3/8 x 1 3/4 x 8 1/2	Nonswitching. As above.	
	DCA3250	250.00	A			95	40	20-20	0.08	P		No	8 3/4 x 3 x 9		
EPI	LDA40	99.95	A			86	20	40-20	0.8	P	No		1 3/4 x 5 1/2 x 4		
	LDA100	174.95	A			86	50	20-20	0.5	S	No		3 1/4 x 8 3/4 x 6 1/4		
FUJITSU TEN	UM-116	29.95	A			70	9	100-15	5	P	No	Yes	3 x 1 x 2		
	UM-114	74.95	A			70	25	40-50	1	P	Sel.	Yes	5 1/2 x 1 3/8 x 3 3/8		
	UM-132	84.95	A												
	QM-251	149.95	A			70	50	40-20	0.3	Sel.	No	Yes	5 7/8 x 2 x 6 1/4		
	QM-582	209.95	A												
	QM-570	209.95	A												
QE-231	119.95	P/E	9	12					P	Yes	Yes	5 7/8 x 2 x 4 3/8			
FULTRON	15-0727	50.00	A/E	2	12	50	13		5	Sel.	No	No	3 3/8 x 1 1/8 x 4 7/8	Includes spectrum analyzer.	
	15-0732	90.00	A/E	7	12	50	13		5	Sel.	Yes	No	6 3/8 x 1 1/4 x 4 9/4		
	15-0734	120.00	A/E	7	12	58	33		5	Sel.	Yes	No	6 1/4 x 1 7/8 x 6 1/2		
	15-0738	180.00	A/E	7	12	50	15 x 2, 30 x 2		5	Sel.	Yes	No	7 1/8 x 2 x 7 1/8	As above. Bridgeable.	
	15-0750	150.00	A			65	50		1	Adj.	No	No	8 1/4 x 2 3/4 x 8 1/4		
DAVID HAFNER	MA-1	449.00	A		100	100	20-20	0.01	0.01	P	Yes	No	11 1/4 x 7 7/8 x 2 3/8		
HARMAN/KARDON	CA260	450.00	A		80	60	10-100	0.1	0.1	Sel.	No	No	15 3/8 x 3 7/8 x 7 7/8	Bridgeable; includes active crossover. As above.	
	CA240	325.00	A		72	40	10-100	0.1	0.1	Adj.	No	No	12 1/2 x 2 3/4 x 8		
	CA215	125.00	A		84	12	10-100	0.2	0.2	Sel.	No	No	8 1/4 x 1 3/4 x 6 1/4		
	CA205	55.00	A		90	3.5	10-100	0.2	0.2	P	No	No	7 7/8 x 1 1/2 x 4 1/4		
HI-COMP	HCE-760	120.00	A/E	7	12	75	30	50-20	1	Sel.	Yes	No	1 1/2 x 3 3/8 x 4 7/8	Bridgeable. As above.	
	HCB-818	60.00	A			85	18	20-20	0.05	Adj.	No	No	2 3/4 x 6 3/4 x 7 1/2		
	HCB-840	160.00	A			85	40	20-20	0.05	Adj.	No	No	2 3/4 x 6 3/4 x 11 3/4		
	HCB-865	200.00	A			85	65	20-20	0.05	Adj.	No	No			
HIFONICS	Mercury	99.00	A		75	16	20-20	0.1	0.1	Sel.			2 1/4 x 9 x 1 5/8	Includes active crossover. Parametric.	
	Pluto	165.00	A		90	30	20-25	0.15	0.15	P			2 1/8 x 7 3/8 x 4 3/4		
	Vulcan	230.00	A		95	50	10-32	0.02	0.02	P			2 1/4 x 9 x 4 1/8		
	Odin	330.00	A		97	75	10-32	0.02	0.02	P			2 1/4 x 9 x 5 1/2		
	Thor	450.00	A		100	125	10-32	0.02	0.02	P			2 1/4 x 9 x 7 1/2		
	Zeus	650.00	A		102	275	10-32	0.02	0.02	P			2 1/4 x 9 x 13 1/2		
	Gemini	450.00	A		88	50 x 4	10-32	0.08	0.08	P			2 1/8 x 7 3/8 x 8 3/8		
	Ceres	400.00	P/E	3	20	85			0.02	0.02		Yes			7 1/2 x 2 1/8 x 4 3/4
	Triton	200.00	P/E	10	12	85			0.02	0.02		Yes			7 1/2 x 2 1/8 x 4 3/4
	HITACHI	MA-9A	399.95	A		100	65	5-300	0.1	0.1	P	No	No		8 3/4 x 3 x 9
ME-8A		299.95	A/E	7	12	75	17	20-45	3	P	Yes	No	6 x 2 x 4 3/4		
MA-D4		89.95	A		75	17	20-45	3	3	P	Yes	No	7 7/8 x 1 x 6 1/8		
INFINITY	MRA-150	319.00	A		100	60	20-20	0.25	0.25	Adj.		No	7 3/8 x 2 1/4 x 10 1/2		
	MRA-90	199.00	A		100	35	20-20	0.25	0.25	Adj.		No	7 3/8 x 2 1/4 x 8 1/2		
JENSEN	A35	74.95	A		80	15	20-20	0.3	0.3	Sel.	No	Yes	1 3/4 x 3 1/4 x 4 1/2		
	EQA5000	139.95	A/E	7	+ 18, -6	80	15	20-20	0.3	Sel.	Yes	Yes	1 1/2 x 6 x 4 1/2		
	EQA2500	89.95	A/E	5	12	80	10	20-20	0.5	Sel.	Yes	Yes	1 1/2 x 4 7/8 x 4 5/8		
JSE	214	119.95	A/E	5	12	85	25	20-20	1.0	Sel.	Yes	No	5 1/2 x 1 3/4 x 6 1/2		
	224	159.95	A/E	7	12	85	50	20-20	1.0	Sel.	Yes	No	6 7/8 x 1 3/4 x 6 1/2		
	236	179.95	A/E	9	12	85	70	20-20	1.0	Sel.	Yes	No	6 7/8 x 1 3/4 x 6 1/2		
	260	109.95	A/E	7	12	85	25	20-20	1.0	Sel.	Yes	No	5 1/2 x 1 1/4 x 6 1/4		
	262	189.95	A/E	8	12	85	40	20-20	1.0	Sel.	Yes	No	6 7/8 x 1 3/4 x 6 1/2		
	264	229.95	A/E	12	12	85	70	20-20	1.0	Sel.	Yes	No	6 7/8 x 1 3/4 x 6 1/2		



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AMPS/EQUALIZERS

MANUFACTURER	Model	Price, \$	Preamp (P), Amp (A), Equalizer (E)	Number of EQ Bands	Booster/Cut Range, ±dB	S/N Ratio, dB	Watts/Channel into 4 Ohms, per IFA RS-490	Power Bandwidth, Hz to kHz, per IFA RS-490	THD at Rated Output, %	Input Levels, Selectable (Sel.), Adjustable (Adj.)	Fader Control?	Preamp (P), Speaker (Sp), Adjustable (Adj.)	Application Guide Available?	Dimensions, inches	Notes
JVC	KSA16	35.00	A		90	3		100-20	0.8	P	No	No		4 x 1 1/4 x 2 7/8	Includes time delay.
	KSA51	80.00	A		90	12		40-20	0.8	Sel.	No	No		6 x 1 1/4 x 3 1/8	
	KSA150	200.00	A		90	35		40-20	0.5	Sel.	No	No		8 3/4 x 3 x 7 7/8	
	KSEA51	140.00	A/E	7	12	90	12	40-20	0.8	Sel.	No	No		6 x 1 1/4 x 6	
	KSE6	100.00	E	7	12	90				Sel.	No	No		4 x 1 3/4 x 4	
	KSE8	180.00	E	7	12	90				Sel.	Yes	No		6 x 1 1/4 x 6	
KENWOOD	KGC-9400	329.00	P/E	7	12	97				P	Yes	Yes		7 1/8 x 1 x 5 7/8	Eight EQ presets; includes spectrum analyzer.
	KGC-7400	219.00	P/E	9	12	97				P	Yes	Yes		5 7/8 x 2 x 5 1/8	
	KGC-4400	149.00	P/E	5	12	100				P	Yes	Yes		3 1/2 x 1 x 4 3/8	Includes active crossover and subwoofer output.
	KGC-4300	159.00	P/A/E	7	12	92	15	20-50	1	Sel.	Yes	Yes		5 7/8 x 2 x 5 5/8	
	KAC-9020	449.00	A			100	100	2-100	1	Adj.	No	Yes		11 1/2 x 2 3/4 x 8 3/4	
	KAC-8020	349.00	A			100	80	2-100	1	Adj.	No	Yes		9 1/2 x 2 1/4 x 7 7/8	
	KAC-7020	249.00	A			100	37	2-100	1	Adj.	No	Yes		5 7/8 x 2 1/8 x 5 7/8	
	KAC-887	159.00	A			92	15 x 4	20-50	1	Sel.	No	Yes		5 5/8 x 2 1/8 x 6 1/4	
	KAC-501	95.00	A			94	15	20-50	1	Sel.	No	Yes		5 7/8 x 1 x 6 1/8	
	KRACO	KE-6B	99.95	A/E	7	12	70	20	15-10	10	S	Yes	No		5 x 5 x 1 1/4
KE-4		89.95	A/E	5	12	65	15	12-10	10	S	Yes	No		4 x 4 1/2 x 1 1/4	
LINEAR POWER	402	179.95	A		95	20	20-20	0.15	Sel.	No	No	No		5 x 8 3/8 x 1 3/4	Switchable environmental EQ.
	452		A		95	22.5	20-20	0.05	Sel.	No	No	No			
	602	229.95	A		95	30	20-20	0.05	Sel.	No	No	No		6 1/2 x 8 x 2 1/4	
	952		A		95	47.5	20-20	0.05	Sel.	No	No	No			
	1002	299.95	A		95	50	20-20	0.05	Sel.	No	No	No		3 x 9 3/4 x 6	
	1752		A		95	175 x 1	1-400	0.05	Sel.	No	No	No		3 x 9 3/4 x 9	Servo subwoofer amp.
	PA-2		P/E	4	12	105									
	2002	399.95	A		95	100	20-20	0.05	Sel.	No	No	No		3 x 9 3/4 x 9	
	3002	699.95	A		95	150	20-20	0.05	Sel.	No	No	No		3 x 9 3/4 x 12	
	5002	899.95	A		95	250	20-20	0.05	Sel.	No	No	No		3 x 9 3/4 x 14 1/2	
	2602	379.95	A		95	30 x 2, 60 x 1	20-20	0.05	Sel.	No	No	No		2 7/8 x 8 x 10	
2121	699.95	A		95	60 x 2, 120 x 1	20-20	0.05	Sel.	No	No	No		3 x 9 3/4 x 12		
EQ-1	199.95	E	6	10	105			0.005	Sel.	No	No		1 3/4 x 5 1/8 x 4 1/2	As above; triamp capable.	
LIRPA LABS	1-UP	799.95	P	1	3	6	9 x 12	18-34	17.2	Opt.	Yes	Yes		2 x 37 1/8 x 4	Includes active crosswalk.
MAGNADYNE	EQ36	49.95	A/E	7	12	50	25	40-20	1	S	Yes	No		6 1/4 x 5 x 1	dbx Type II noise reduction. †Amp. 4 3/4 x 5 x 1; EQ, 7 3/8 x 4 3/8 x 2. As above. Bridgeable. As above; bass EQ.
	EQ45	85.95	A/E	7	12	50	35	20-20	1	Sel.	Yes	No		6 1/2 x 5 1/8 x 1 5/8	
	EQ46	79.95	P/E	5	12	62				P	Yes	No		6 1/2 x 5 1/8 x 1 5/8	
	EQ58	119.95	A/E	7	12	90	35	20-20	1	Sel.	Yes	No		6 1/2 x 5 1/8 x 1 5/8	
	EQ62	159.95	P/A/E	7	12	90	30 x 4	20-20	10	Sel.	Yes	No		†	
	LS2001	179.95	A		63	50	15-35	0.05	Sel.	No	No	No			
LS4001	239.95	A/E	2	6.5	63	100	10-70	0.05	Adj.	No	No				
MAGTONE	2285	399.95	A		85	100 x 2, 50 x 4		20-20	0.5	Sel.		No		15 x 2 3/8 x 9 1/2	
	2385	299.95	A		85	50 x 2, 25 x 2, 25 x 4		20-20	0.5	Sel.		No		8 5/8 x 2 3/8 x 9 1/2	
	2185	239.95	A		85	75	20-20	0.5	Sel.		No	No		9 1/2 x 2 x 7 3/8	
	2020	59.95	A		80	25	40-25	0.5	P		No	No		4 x 1 1/2 x 5	
	207	139.95	A		80	15 x 4	20-20	0.5	Sel.	Yes	No	No		5 1/2 x 1 3/8 x 4 1/8	
	209	89.95	A/E	7	12	75	25 x 4	20-20	0.5	S	Yes	No		5 1/2 x 1 3/8 x 4 1/8	
	4070	99.95	P/E	7	12	88		20-20	0.5	Sel.	Yes	No		5 1/2 x 1 3/8 x 4 1/8	
MAJESTIC	MEB 7200CM	169.95	P/A/E	7	12	80	40	20-20		Sel.	Yes			6 3/8 x 2 x 6 1/4	Four EQ memories; includes spectrum analyzer; floating and common ground. Floating and common ground.
	MEB 5700	79.95	A/E	7	12	65	30	20-20		Sel.	Yes			6 3/8 x 2 x 6 3/8	
	MEB 7400CM	199.95	A/E	7	12	65	40 x 2, 75 x 2	20-20		Sel.	Yes			7 x 2 x 7 1/4	
	MA 150HD	89.95	A		65	75	20-20							5 7/8 x 3 3/8 x 6 3/8	Four EQ memories; includes spectrum analyzer; floating and common ground.
	MA 240	129.95	A		70	30 x 2, 75 x 2	20-20							7 3/8 x 2 x 6 3/8	
	MA 500	249.95	A		65	250	20-20							11 1/2 x 3 x 8 5/8	
MPA 9000	99.95	P/E	7	12	80								6 3/8 x 2 x 6 1/4	Floating and common ground.	
MANSOOR	PA705B	34.95	A		60	16	40-22	0.8	S					4 1/8 x 1 x 5	
	PA300H	89.95	A		70	30	20-20	0.8						6 7/8 x 2 1/2 x 6 7/8	
	PA400H	139.95	A		75	30	20-20	0.8	Sel.					7 x 2 3/4 x 6 5/8	
	PA600H	139.95	A		75	50	20-30	0.8	Sel.					7 x 2 3/4 x 9 1/2	
	PA750H	279.95	A		80	50	20-30	0.8	Sel.					7 1/8 x 3 x 11 1/8	
	EA825B	59.95	A/E	5	12	60	13.5	30-18	0.8	S	Yes			5 5/8 x 1 1/8 x 4 3/8	
	EA817B	74.95	A/E												
	EA840H	134.95	A/E	7	12	64	30	40-18	0.8	S	Yes			6 1/2 x 2 x 7	
	EA850H	139.95	P/A/E	7	12	60	25	20-30	0.8	Adj.	Yes			6 3/8 x 1 7/8 x 5 7/8	
	EA718P	119.95	A/E												
MARANTZ	SA402	99.95	A			30		1.0	Sel.					5 7/8 x 3 1/8 x 6 1/4	
METROSOUND	EQ374	269.95	A/E	7			50 x 4		10	Sel.	Yes	Yes		6 7/8 x 7 1/4 x 1 7/8	Four memories; includes spectrum analyzer. Separate front and rear EQ.
	EQ345	199.95	A/E	18			16 x 2, 30 x 2		10	Sel.	No	Yes		6 1/8 x 6 1/2 x 2 1/4	

It even comes with a special handling package.

Yamaha's new YCD-1000 is better equipped to handle the road than other car compact disc players.

One reason is our special CD cartridge system.

Simply put your favorite compact discs into the patented Yamaha CD cartridges. Then when you're driving, all you do is slip the cartridge into the player. A shutter opens on the cartridge to allow the laser beam to play the disc. And the music starts automatically. No awkward and dangerous fumbling around. And no fingerprints or dust on your compact discs.

The YCD-1000 also has its own shock absorber system. This system uses soft rubber connectors to suspend the player's internal circuitry and mechanical parts. So even if you go off road, the music stays on track.

But many of the YCD-1000's excellent road manners were learned at home.

We took the exclusive LSI technology from our home CD players and further miniaturized it. So you get the same high

reliability, tracking precision, and superior digital-to-analog conversion.

You'll also find a newly developed and much more compact version of our home CD's 3-beam laser pickup. For even greater tracking stability.

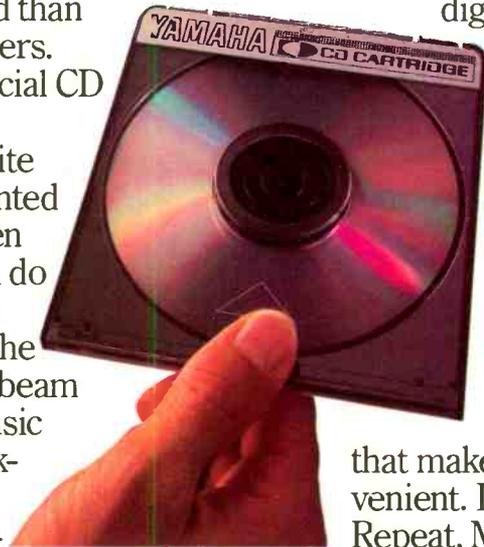
And the same double-resolution 88.2 kHz (instead of the standard 44.1 kHz) digital filter for improved high-frequency imaging and clarity.

Plus many of the features that make our home CD players so convenient. Like Music Scan, Continuous Repeat, Music Search, and an easily seen black-on-red LCD display.

You'll even find the price of the YCD-1000 easy to handle.

So if you're thinking of adding a compact disc player to your car's audio system, head for your Authorized Yamaha Dealer. He's got the one that outperforms the rest.

Yamaha Electronics Corporation, USA, P.O. Box 6660, Buena Park, CA 90622



AMPS/EQUALIZERS

MANUFACTURER	Model	Price, \$	Preamp (P), Amp (A), Equalizer (E)	Number of EQ Bands	Bass/Cut Range, Hz	Mid Range, Hz	High Channel Input & Chims, per EIA RS-490	Power Bandwidth, Hz to kHz, per EIA RS-490	THD at Rated Output, %	Input Level, Preamp (P) Searer (S) Selectable (Sel.), Adjustable (Adj.)	Fader Control?	Application Guide Available?	Dimensions, Inches	Notes
METROSOUND (Continued)	EQ363	199.95	A/E	7		30 x 2, 75 x 2		10	Sel.	Yes	Yes	Yes	6 7/8 x 7 1/4 x 1 7/8	
	EQ360	189.95	A/E	7		50		10	Sel.	Yes	Yes	Yes	6 1/4 x 1 3/4 x 6 1/2	
	EQ314	79.95	A/E			30		10	Sel.	Yes	Yes	Yes	5 1/8 x 5 1/4 x 1 1/4	
MITSUBISHI	CVX-2	90.00	A			80	17	70-20	1	P	No	No	1 x 6 7/8 x 5 5/8	†Part of CD-100 System 1 (see "CD Players" section).
	CVX-3	180.00	A			75	40	70-20	1	P	No	No	2 x 7 x 9 1/2	
	CV-231	130.00	A/E	6	12	70	13	70-20	1	Sel.	Yes	No	2 x 5 5/8 x 6 1/4	
	CV-232	†	A/E	6	12	70	13	70-20	1	Sel.	No	No	2 x 5 5/8 x 6 1/4	
	CY-261	60.00	A			70	13	70-20	1	S	No	No	2 x 5 5/8 x 4 1/2	
	CV-251	100.00	A			70	13 x 4	70-20	1	P	No	No	2 x 5 5/8 x 6 1/4	
MONOLITHIC SOUND	PA-4000	999.00	A			90	240	10-100	0.05	Adj.			3 3/8 x 10 x 13 1/8	Includes crossover.
	PA-2400X	599.00	A			90	60 x 4	10-50	0.05	Adj.	Yes		2 7/8 x 12 x 6 5/8	
	PA-2400F	599.00	A			90	60 x 4	10-50	0.05	Adj.			2 7/8 x 12 x 6 5/8	
	PA-2400Q	499.00	A			90	60 x 4	10-50	0.05	Adj.			2 7/8 x 12 x 6 5/8	
	PA-1600M	499.00	A			90	240 x 1	10-100	0.05	Adj.			2 7/8 x 12 x 6 5/8	
	PA-1600	499.00	A			90	100	10-50	0.05	Adj.			2 7/8 x 12 x 6 5/8	
	PA-700	359.00	A			90	70	10-50	0.05	Adj.			2 7/8 x 10 x 6 5/8	
	PA-500	259.00	A			90	50	10-50	0.05	Adj.			2 x 7 7/8 x 5 1/4	
	PA-400	199.00	A			80	20 x 4	10-20	0.1	Adj.			1 1/2 x 4 x 4 3/4	
	PA-200	129.00	A			80	20	10-20	0.1	Adj.			1 1/2 x 4 x 4	
	EQ-4	299.00	P/E	4	12	85			0.05	Adj.			1 1/2 x 4 3/8 x 4 1/8	
NAKAMICHI	PA-400M	429.00	A			110	140 x 1	5-50	0.002	P	No	No	12 5/8 x 1 1/8 x 6 3/8	L + R mixing. Low-cut inputs provided.
	PA-350	390.00	A			110	35 x 4	5-50	0.005	Adj.	No	No	12 5/8 x 1 1/8 x 6 3/8	
	PA-300II	370.00	A			115	75	5-50	0.003	P	No	No	12 5/8 x 1 1/8 x 6 3/8	
	PA-200	249.00	A			110	30	10-50	0.005	Sel.	No	No	7 1/2 x 1 3/4 x 6 3/8	
	PA-150	198.00	A			100	14 x 4	20-20	0.05	Adj.	No	No	5 7/8 x 1 1/4 x 4 1/2	
PANASONIC	CY-SA30	79.95	A			83	12.5	20-30	1.0	Adj.		Yes	5 1/2 x 1 1/2 x 4 1/4	Includes active crossover in rear amp.
	CY-SA61	229.95	A			95	60	20-20	0.05	Adj.		Yes	7 1/8 x 2 1/8 x 7 1/8	
	CY-SB25	69.95	A			85	25	20-40	1.0	S		Yes	5 1/2 x 4 1/4 x 1 1/2	
	CY-SG60	119.95	A/E	7		83	25	20-30	0.8	Sel.	Yes	Yes	6 3/8 x 2 x 4 3/8	
	CY-SG100	199.95	A/E	7		83	25 x 4	20-30	1.0	Sel.	Yes	Yes	7 x 2 x 6	
PARASOUND	1200EQB	239.95	A/E	7	12	80	40 x 2, 20 x 2	20-20	0.8	Sel.	Yes	No	7 x 2 x 7	Includes crossover.
	850EQB	189.95	A/E	7	12	80	40 x 2, 20 x 2	20-20	0.8	Sel.	Yes	No	7 x 2 x 7	As above plus image expander.
	750EQB	159.95	A/E	7	12	80	22	20-20	0.8	Sel.	Yes	No	7 x 2 x 6 1/2	Includes spectrum analyzer.
	700EQB	179.95	A/E	7	12	80	40	20-20	0.8	Sel.	Yes	No	7 1/2 x 2 x 7 1/2	
	500EQB	139.95	A/E	7	12	80	15	20-20	0.8	Sel.	Yes	No	6 1/4 x 2 x 6	Includes active crossover.
	100EQB	99.95	A/E	10	12	65	13	20-20	0.8	S	Yes	No	6 1/4 x 1 x 6	
	900A/B	229.95	A			80	90	20-20	0.1	Sel.		No	8 1/2 x 2 x 8	
	8040A/B/X	199.95	A			80	40 x 2, 20 x 2	20-20	0.8	Sel.		No	8 3/4 x 2 x 7	
	400A/B	129.95	A			80	40	20-20	0.8	Sel.		No	4 1/2 x 3 1/4 x 6 1/4	As above.
	350EQP	149.95	P/E	9	12	80	40	20-20	0.25	Sel.	Yes	No	4 3/4 x 2 x 6 1/4	
PECONIC	9070	89.95	A/E	7	12	80	15	20-20	0.1	S	Yes	No	1 3/4 x 6 x 5 3/4	
	9050	24.95	A/E	7	12	15	15	20-20	0.1	S	No	No	1 x 4 1/8 x 4 1/2	
PHILIPS	AP 165	199.95	P/E	7	12	90		0.05	P	Yes			6 3/4 x 1 x 5 5/8	
	AP 363	149.95	A/E	7	12	90	20	20-20	10	Sel.	Yes		7 1/4 x 2 3/8 x 3 3/4	
	AP 364	199.95	A/E	7	12	90	20 x 4	20-20	10	Sel.	Yes		7 1/4 x 2 3/8 x 3 3/4	
	AP 264	119.95	A			90	20 x 4	20-20	10	P	No		7 1/8 x 2 3/8 x 2 3/8	
	AP 210	279.95	A			90	70	20-20	10	Sel.	No		9 x 2 5/8 x 8	
PIONEER	BP-780	159.95	A/E	7	12	90	12 x 4	50-20	5.0	Sel.	Yes	Yes	2 x 5 5/8 x 5 3/8	Three presets; includes spectrum analyzer.
	BP-540	104.95	A/E	7	12	90	12	50-20	5.0	Sel.	Yes	Yes	1 3/8 x 5 3/8 x 6 3/8	
	GM-A200	299.95	A			100	70	30-20	0.3	Sel.			2 3/8 x 9 1/2 x 10 5/8	
	GM-A120	169.95	A			80	30	30-20	0.3	Sel.			2 3/8 x 5 7/8 x 8 1/4	
	GM-43	69.95	A			90	12	30-20	0.8	Sel.			1 x 5 7/8 x 5 7/8	
	GM-41	64.95	A			90	12	30-20	0.8	P			1 x 5 7/8 x 5 7/8	
	EQ-E303	249.95	E	7	12	85				P	Yes		1 x 5 7/8 x 5 7/8	
	EQ-E10	99.95	E	7	12	85				P	Yes		1 x 5 7/8 x 5 7/8	
PRECISION POWER	PEQ-223	150.00	P/E	3	15	102		0.005	P	No	No	No	1 1/4 x 4 1/4 x 3 1/4	Four selectable center frequencies per band; CD input with volume control. †Fixed, 2-band EQ; mid-bass notch filter.
	PAR-224	250.00	P/E	4	18	102		0.002	P	Yes	No	No	1 1/2 x 4 3/4 x 4 1/4	
	EQM-300	75.00	P/E	†	+10, -6	102		0.004	P	No	No	No	1 1/4 x 3 3/4 x 3	
	PPI-2030	195.00	A			98	30	10-50	0.02	P	No	No	2 x 8 x 7	
	PPI-2050	320.00	A			98	50	10-50	0.02	P	No	No	2 x 8 x 8 1/2	
	PPI-2075	370.00	A			98	75	10-50	0.02	P	No	No	2 x 8 x 9	
	PPI-2150	450.00	A			102	100	10-50	0.02	P	No	No	2 x 8 x 15	
	PPI-2400	600.00	A			98	200	10-50	0.05	P	No	No	2 x 8 x 20	
	PPI-4050	495.00	P/A			98	40 x 2, 150 x 1	10-50	0.1	P	No	No	2 x 8 x 15	
		PPI-4030	350.00	A			102	30 x 4	10-50	0.02	P	Yes	No	
	PPI-2400	650.00	A			98	200	10-50	0.05	P	No	No	2 x 8 x 20	
PROTON	220	60.00	A			90	14	30-20	0.1	Sel.		No	Bridgeable. Includes active crossover. Preamp out.	
	D230	200.00	A			90	32	30-20	0.08	Sel.		No		
	250	250.00	A			90	50	20-20	0.04	Sel.		No		
	271	190.00	P/E	7	18	90		20-20	0.05	P	Yes	No		
	272	190.00	A/E	7	18	90	14	30-20	0.1	Sel.	Yes	No		
	222	130.00	A			90	20	20-20	0.04	Sel.		No		

BETTER. MUCH BETTER. NONE BETTER.

Improving on the sonic performance of the Denon DCD-1500 was no easy task, considering that reviewers in the U.S., West Germany, and Japan claim "never to have heard a better sounding CD player." Yet Denon set out to build players that exceed our original performance level *and* make them more affordable.

We began with the compact DCD-1000, a Denon CD Player at an unthinkable low \$379.95* Yet it includes Denon's unique DDAC, the world's only digital-to-analog converter that's hand-tuned for reduced D/A transfer distortion. And it has Denon's Real Time phase correction circuitry.

Better still is Denon's DCD-1100. This full-sized machine has the same high-performance DDAC, the same Real Time phase correction, and adds wireless remote control with a 10-key pad for direct track access.

The deluxe DCD-1500 uses two separate 16-bit DDAC converters (one for each channel), and computer-analyzed linear-phase filtration for perfectly flat frequency response. Its wireless remote even features volume adjustment.

Now, no matter how much or how little you plan to spend for a CD Player, you can own one from the first name in digital audio. Denon.



DENON

D E S I G N I N T E G R I T Y

*Suggested retail price.

Enter No. 17 on Reader Service Card

Denon America, Inc., 27 Law Drive, Fairfield, N.J. 07006

AMPS/EQUALIZERS

MANUFACTURER	Model	Price, \$	Preamp (P), Amp (A), Equalizer (E)	Number of EQ Bands	Boost/Cut Range, ±dB	S/N Ratio, dB	Watts/Channel into 4 Ohms, per IEC RS-400	Power Bandwidth, Hz to kHz, per IEC RS-400	THD at Rated Output, %	Input Levels: Preamp (P), Selectable (Sel), Adjustable (Adj.)	Fader Control?	Application Guide Available?	Dimensions, inches	Notes	
PYLE	A50	159.95	A				100	25	10-50	0.09	Sel.	No	Yes	2 x 8 x 7	Bridgeable. As above. As above. As above. Inputs for receiver and CD.
	A100	299.95	A				100	50	10-50	0.09	Sel.	No	Yes	2½ x 10¼ x 7	
	A200	439.95	A				100	100	10-50	0.09	Sel.	No	Yes	2½ x 12¼ x 7	
	A400	599.95	A				100	200	10-50	0.09	Sel.	No	Yes	2½ x 12¼ x 10	
	A140/4 PA1	325.95 199.95	A P/E	4	12		100	100	10-50	0.09 0.01	Sel. Sel.	No Yes	Yes Yes	2½ x 12¼ x 7 1½ x 5½ x 4¾	
REALISTIC	12-1871	59.95	E										Yes		
	12-1865	54.95	E										Yes		
	12-1867	39.95	E										Yes	1¼ x 5½ x 4¾ 2 x 5½ x 4	
ROADSTAR	AD-4030	129.95	A				80	50	20-25	1	Sel.			5½ x 2½ x 7½	
	AD-4020	59.95	A				75	20	30-25	1	Sel.			4½ x 1½ x 6½	
	AD-4010	39.95	A				75	10	40-25	1	S			4½ x 1½ x 3	
	AD-4260	49.95	A/E				75	10	30-25	1	S	Yes		5½ x 1¼ x 4¾	
	AD-4250	39.95	A/E				75	10	30-25	1	S			5½ x 1¼ x 4¾	
ROCKFORD FOSGATE	Punch 45 MOSFET	200.00	A/E	2	†		80	37.5	15-100	0.5	Sel.	No	No	8 x 5½ x 2	† +18 dB at 45 Hz, +12 dB at 20 kHz. Includes active crossover; bridgeable. As above.
	Punch 75	300.00	A/E	2	†		80	37.5	15-100	0.5	Sel.	No	No	8 x 7¼ x 2	
	Punch 150	420.00	A/E	2	†		80	75	15-100	0.5	Sel.	No	No	8 x 9¼ x 2	
	Power 300 MOSFET	875.00	A/E	2	†		80	50 x 4	15-100	0.5	Sel.	No	No	8 x 15¼ x 2½	
	Power 650 MOSFET	1500.00	A				80	125 x 4	15-20	0.5	Sel.	No	No	8 x 19¼ x 2½	
	PA-1	275.00	P/E	3	12		90			0.01	Sel.	Yes	No	6¾ x 3½ x 1½	
250	150.00	P/E	2	†		90			0.01	Sel.	No	No	4 x 3 x 1½		
SANSUI	SM-150	299.00	A				85	30 x 2, 20 x 2	20-50	0.05†		No	Yes	7½ x 2½ x 8½	† Rear channel, 0.008% THD.
	SM-100	229.00	A				90	32	20-20	0.008		No	Yes	7½ x 2½ x 8½	
	SM-50	99.00	A				90	12	30-20	0.05		No	Yes	3½ x 1½ x 6½	
	SGA-500	149.00	A/E				80	16		0.05		Yes	Yes	6 x 2 x 5½	
SANYO	PA7020	99.95	A				100	20	20-20	0.05	Sel.	No	Yes	7½ x 2½ x 8	
	PA6050	129.95	A				70	50	20-20	0.05	Sel.	No	Yes		
	PA7050	159.95	A				100	50	20-20	0.05	Sel.	No	Yes		
	EQZ6210	79.95	E				70					Yes	Yes	6½ x 2 x 4¾	
	EQZ10	129.95	E				70					Yes	Yes	5½ x 2 x 6½	
SHERWOOD	EQA 260	99.95	A/E	7	12		85	13	30-20	0.5	P	Yes	Yes	1½ x 6¼ x 6	Bridgeable.
	EQA 280	99.95	A/E	7	10		85	12	50-20	0.5	P	Yes	Yes	1 x 7¼ x 6	
	SCA 240	79.95	A				85	13	30-20	0.5	P	No	Yes	1½ x 6 x 6½	
	SCA 2100	199.95	A				90	70	20-20	0.5	P	No	Yes	3¾ x 8 x 9½	
SONY	XM-120	299.95	A/E	2	6		92	60	20-20	0.1	P	No	No	7½ x 1¾ x 10¼	Stereo/mono switch.
	XM-700	219.95	A				106	40	20-20	0.1	P	No	No	7½ x 2½ x 7½	
	XM-640	169.95	A				105	22	20-20	0.5	P	No	No	7 x 1½ x 6	
	XM-600	129.95	A				75	14 x 4	20-20	0.8	P	No	No	9½ x 1¼ x 6½	
	XM-300	79.95	A				14		30-20	0.8	P	No	No	7½ x 1 x 6½	
	XM-E70	179.95	A/E	7	12		65	12	80-20	1.0	P	Yes	No	7½ x 1¼ x 6	
	XM-E50	119.95	A/E	5	12		65	12	40-20	1.0	P	Yes	No	7½ x 1 x 6	
	XE-110	149.95	E	11	12		92				P	Yes	No	7 x 1 x 5½	
SOUNDSTREAM	D200	449.00	A				85	100	20-20	0.1	Sel.	No	No	2¼ x 7 x 11½	Dual mono; bridgeable. Class A; bridgeable. Bridgeable. Rear-amp bridgeable.
	Class A40	350.00	A				85	16	20-20	0.1	Sel.	No	No	2¼ x 7 x 6½	
	D100	295.00	A				85	50	20-20	0.1	Sel.	No	No	2¼ x 7 x 6½	
	SF90	320.00	A				85	15 x 2, 30 x 2	20-20	0.1	Sel.	No	No	2¼ x 7 x 6½	
	D30	119.00	A				85	15	20-20	0.25	Sel.	No	No	5½ x 1½ x 2¼	
SPARKOMATIC	GE70	89.95	A/E	7	12		70	20 x 4	20-20	10		Yes	Yes	6¼ x 2½ x 6¼	
	GE50	34.95	A/E	5	12			22.5	20-20	10		Yes	Yes	4¾ x 1½ x 4¾	
	LC52	17.95	A					20	20-20	10		No	Yes	4¼ x 1¼ x 4	
SPECO	EP8-150	129.95	A/E	10	12		75		20-20	0.1			Yes	6½ x 1¼ x 5½	Includes active crossover. As above.
	EPB-100	99.95	A/E	7	12		50		25-20	0.1			Yes	5½ x 1½ x 5½	
SUNKYONG	SQ-100	90.00	P/A/E	7	15		60	25 x 4	20-21		Sel.	Yes	Yes	6½ x 2 x 6½	
TECHNICS	CY-M160	249.95	A				100 dB	60			P	No	Yes	7½ x 2 x 7¾	
	CY-M125	99.95	A				90 dB	25			P	No	Yes	7 x 1 x 5½	
	CY-EQ9	149.95	E	9	12		95 dB				P	Yes	Yes	7 x 1 x 5½	
ULTIMATE SOUND	PA1004	249.95	A				50 x 2, 25 x 4		20-20	0.08	Sel.			8 x 2¼ x 13¾	2-, 3-, or 4-channel selectable operation. As above.
	PA2004	349.95	A				100 x 2, 50 x 4		20-20	0.08	Sel.			8 x 2¼ x 13¾	
ULTRX	UA1000	200.00	A				70	50	20-20	0.05	S		No	8¼ x 4 x 7½	
	UA1100	300.00	A					75	20-20	0.05	S		No	8 x 3 x 8¾	
YAMAHA (Continued)	YGE-600	219.00	E	5	12		95			0.02	Sel.	Yes	Yes	6¼ x 2 x 4¾	
	YGE-400	159.00	E	7	12		100			0.02	Sel.	Yes	Yes	6½ x 1¾ x 6½	
	YPA-800	369.00	E				95	100	30-20	0.25	Sel.	Yes	Yes	6¼ x 1¾ x 9¾	
	YPA-600	269.00	A				90	50	30-20	0.01	Sel.	Yes	Yes	8½ x 3 x 9¾	

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*Ivan Berger. *Audio*, April, 1986



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AMPS/EQUALIZERS

MANUFACTURER	Model	Price, \$	Preamp (P), Amp (A), Equalizer (E)	Number of EQ Bands	Booster/Cut Range, ±dB	S/N Ratio, dB	Watts/Channel Into 4 Ohms, per EIA RS-490	Power Bandwidth, Hz to kHz, per EIA RS-490	THD at Rated Output, %	Input Levels: Preamp (P), Speaker (S), Selectable (Sel.), Adjustable (Adj.)	Fader Control?	Application Guide Available?	Dimensions, inches	Notes
YAMAHA (Continued)	YPA-400	209.00	A			90	18 x 4	30-20	0.01	Sel.			6 1/4 x 1 3/4 x 7 1/4	
	YPA-200	109.00	A	5	12	90	20	30-20	0.5	Sel.	Yes		6 1/2 x 1 3/4 x 7 3/4	
	YGA-618	179.00	A/E			105	18	20-20	0.01	Sel.	Yes		6 1/2 x 1 5/8 x 6 1/2	
ZAPCO	M80	175.00	A			108	80 x 1	10-100 Hz	0.005				7 1/2 x 6 1/4 x 2	Subwoofer amp; includes active crossover.
	System 150	465.00	A			110	78	10-100	0.03				†	†Amp, 5 1/4 x 5 7/8 x 3 3/4 and power supply, 7 x 3 3/8 x 1 1/2.
	System 150A	612.00	A			110	78	10-100	0.02				†	
	System 200	535.00	A			110	100	10-100	0.03				†	
	System 200A	678.00	A			110	100	10-100	0.02				†	
	AGM	46.50	P			95			0.005					5 1/2 x 3 x 1 1/2
PX	480.00	P/E	4	20	105			0.004	Sel.				††	††Main unit, 7 x 5 x 2 and power supply, 5 1/2 x 3 x 1 1/2.
PEQ	345.00	P/E	9	18	92			0.05	Sel.					

CD PLAYERS

MANUFACTURER	Model	Price, \$	Frequency Response, Hz to kHz, ±dB	Dynamic Range, dB	THD, % at 1 kHz	Filtering: Analog D/A (A), Digital + Analog (D)		Loading Single Disc (M), Single Disc Magazine (S)	No. of Programmable Selections	Display Functions: Time (T), Clock (C), Track Number (N)	Repeat Functions: Track (T), Entire Disc (D), Entire Program (P)	AUX Input?	Controls: Volume (V), Balance (B), Fader (F), Tone (T)	Audible Fast Search?	Auto Scan/Disc Search?	TUNER	
						FM Only (A), AM/FM (B), With AM Stereo (C)	Total No. of Station Presets (if applicable)										
ALPINE	5900	600.00	5-20 ± 1	90	0.005	A	A		T/N	T/D	Yes	V/B/T	Yes	T	B	18	
	7900	700.00	5-20 ± 1	90	0.005	A	A		C/M	D	No	V/B/F/T	Yes				
BLAUPUNKT	CDP 05	549.95	20-20	89	0.05	A	B		T/N	D	No	V/B/T	Yes				
CLARION	CD005	799.95	5-20 ± 0.5	90	0.007	D	B	0	T/N	T	No	V/B/T	Yes	D			
FUJITSU TEN	SD-1110	550.00															
HITACHI	CD-D4	599.95	5-20 ± 1.0	90	0.008	D	A	99	T/C/N	T/D/P	Yes	V/B/T	Yes	D			
KENWOOD	KDC-9	659.00	5-20 ± 1	90	0.005	D	A	0	T/N	T/D	Yes	V/B/F/T	Yes				
MITSUBISHI	CD-100 System 1 (With CV-232 amp)	700.00	5-20 +1.0, -1.5	85	0.01	D	A		T/N	T/D	No		No	D	B	10	13
	CD-100 System 2 (With CZ-741 radio and CV-251 amp)	900.00	5-20 +1.0, -1.5	85	0.01	D	A		T/N	T/D	No		No	D	B	10	13 x 4
	CD-100 System 3 (With CZ-741 radio and CL-150 adaptor)	860.00	5-20 +1.0, -1.5	85	0.01	D	A		T/N	T/D	No		No	D	B	10	
	CD-100 System 4 (With JX-3 radio)	900.00	5-20 +1.0, -1.5	85	0.01	D	A		T/N	T/D	No		No	D	C	18	13 x 4
	CD-100 System 5 (With JX-2 radio)	860.00	5-20 +1.0, -1.5	85	0.01	D	A		T/N	T/D	No		No	D	B	18	17
PANASONIC	CQ-E800CD	699.95	5-20	90	0.005	D	A	15	T/C/N	T/D/P		V/B/F/T	Yes	D/T	B	12	
PHILIPS	DCD 85	599.95	20-20	90	0.01	D	A		T/N	P	Yes	V/B/F/T	Yes	D			
	CD 10	399.95	20-20	90	0.01	D	A		T/N	P	Yes	V/B/F/T	Yes	D			
PIONEER	CDX-P1	599.95	10-20 ± 1.0	90	0.005	D	A		T/N	T/D/P	Yes	V/B/F/T	No	D			
	CDX-1	549.95	10-20 ± 1.0	90	0.005	D	A		T/N	T/D/P	No	V/B/F/T	No	D			
ROADSTAR	RS-8000CDX	599.95	5-20	90	0.005		A		T/C/N	T/P	Yes	V/B/F/T	Yes	T	B	12	18
SANYO	FTEC 1	599.95	5-20	90	0.005	A	A	0	T/C/N	T/D	Yes	V/B/F/T	Yes	D/T	B	12	
	FTEC 2	699.95	5-20	90	0.005	A	A	16	T/C/N	T/D/P	Yes	V/B/F/T	Yes	D/T	B	18	
SDNY	CDX-A10 (Optional XT-10 tuner pack, \$129.95)	999.95	5-20 ± 1.0	85	0.015	A	C	15	T/N	T/D	Yes	V/B/F/T	Yes	D/T	B	10	
	CDX-R7	699.95	5-20 ± 1.0	90	0.005	A	A		C/N	T/D	No	V/B/F/T	Yes	D/T	B	10	
	CDX-5	599.95	5-20 ± 1.0	90	0.005	A	A		T/N	T/D	Yes	V/B/T	Yes	D			
TECHNICS	CQ-DP5	699.95	5-20	90	0.005	A	A	15	T/C/N	T/D/P	Yes	V/B/F/T	Yes	T	B	18	
YAMAHA	YCD-1000	549.00	5-20 +0, -3	92	0.05	D	B		T/N	T/D/P	Yes	V/B/T	Yes	D			

RADIOS/TAPE PLAYERS

MANUFACTURER	Model	Price, \$	AMPLIFIER										RADIO							TAPE		
			Average Watts Channel, per EIA RS-430	Power Bandwidth, Hz to kHz, per EIA RS-430	THD at Rated Output, % per EIA RS-430	Outputs: P, Rear (P), Speaker Level (S), Both (Both)	Number of Taps or EQ Controls	FM Sensitivity, dB (For 30-dB Quieting)	Alternate-Channel Selectivity, dB	FM S/N Ratio, dB	Total Number of Station Presets	Tuning: Seek (A), Scan (B), Both (C)	Local/Remote Control: Manual (M), Automatic (A)	AM Stereo Capable? See Code	Noise Reduction? See Code	Tape S/N Ratio, dB (With NR if Applicable)	Auto Reverse?	Program Search?	Tape EQ Switch?	In Dash (I), Out of Dash (O), Convertible (C), Extracable (E)	Application Guide Available?	
AIWA	CT-X500	550.00	8			2		70	12	A	M	No	B/C	71	Yes	Yes	Yes	D	Yes			
	CT-X400	475.00	8			2		70	12	A	M	No	B	64	Yes	Yes	D	Yes				
	CT-X300	350.00	8			2		70	12	A	M	No	B	64	Yes	Yes	D	Yes				
ALPINE	7272	390.00	8	40-20	0.8	Both	2	16.3	80	60	12	A	M		B	64	Yes	Yes	Yes	D	Yes	
	7273	600.00	8	40-20	0.8	Both	2	16.3	80	60	24	A	M		B/C	72	Yes	Yes	Yes	D	Yes	
	7374	800.00				P	2	16.3	80	60	24	A	M		A/B/C	86	Yes	Yes	Auto	D	Yes	
	7375	1300.00				P	2	16.3	80	60	24	A	M		A/B/C	86	Yes	Yes	Auto	D	Yes	
	7900	700.00				P	2	16.3	80	60	18	C	M						Auto	D	Yes	
	7368	450.00				P	2	16.3	80	60	18	A	M						Auto	D	Yes	
	7158	320.00	2.2	70-20	0.8	Both	2	16.3	80	60	12	A	M		B/C	72	Yes	Yes	Auto	I	Yes	
	7159	370.00	2.2	70-20	0.8	Both	2	16.3	80	60	12	A	M		B	64	Yes	Yes	Auto	I	Yes	
	7171	270.00	2.2	70-20	0.8	Both	2	16.3	80	60	12	A	M		B	55	Yes	Yes	Auto	I	Yes	
	7172	330.00	2.2	70-20	0.8	Both	2	16.3	80	60	12	A	M		B	64	Yes	Yes	Auto	I	Yes	
	7163	220.00	2.2	70-20	0.8	Both	2	16.3	80	60	12	A	M		B	55	Yes	Yes	Auto	I	Yes	
	7263	270.00	8	40-20	0.8	Both	2	16.3	80	60	12	A	M		B	55	Yes	Yes	Auto	I	Yes	
	7166	290.00	2.2	70-20	0.8	Both	2	16.3	80	60	12	A	M		B	55	Yes	Yes	Auto	I	Yes	
	7164	340.00	2.2	70-20	0.8	Both	2	16.3	80	60	12	A	M		B	64	Yes	Yes	Auto	I	Yes	
7165	370.00	2.2	70-20	0.8	Both	2	16.3	80	60	12	A	M		B/C	72	Yes	Yes	Auto	I	Yes		
7267	400.00	8 x 4	40-20	0.8	Both	2	16.3	80	60	18	A	M		B	64	Yes	Yes	Auto	I	Yes		
AMERICAN AUDIO	GE-7400AR	110.00	25 x 4	20-25	0.05	S	5	19	55	60		A	No		55	Yes	No	Yes	D	No		
	GE-7200AR	95.00	25 x 4	20-25	0.05	S	5	19	55	60		A	No		55	Yes	No	Yes	D	No		
	CS-6500AR	125.95	12 x 4	20-20	0.08	S	1	19	55	60	5	A	No		55	Yes	No	No	I	No		
	PR-6402	50.95	12	20-20	0.08	S	1	19	55	60		A	No		55	Yes	No	No	I	No		
	PR-730AR	75.95	12	20-20	0.08	S	1	19	55	60		A	No		60	Yes	No	No	D	No		
	ET-9002TV	399.00	25	20-20	0.05	S	1	19	55	65		A	No	D	65	Yes	No	No	D	No		
	ET-8500AR	205.95	25 x 4	20-25	0.05	S	5	15	65	70	6	C	No	D	65	Yes	No	Yes	I	No		
	ET-8502AR	199.95	25 x 4	20-25	0.05	S	2	15	65	70	6	C	No	D	65	Yes	No	No	I	No		
	ET-8300AR	80.00	12	20-20	0.08	S	1	19	55	60		A	No		60	Yes	No	No	D	No		
	GE-7855AR	121.50	12	20-20	0.08	S	10	19	55	60		A	No		60	Yes	No	Yes	D	No		
AX-400AR	99.95	12 x 4	20-20	0.08	S	1	19	55	60		A	No		55	Yes	No	No	D	No			
AX-300	55.95	12	20-20	0.08	S	1	19	55	60		A	No		55	No	No	No	D	No			
A.R.A.	701SX	115.95	3	100-10	2.0	S	1	21.0	40	60	0	No	No	No	45	No	No	No	I	Yes		
	P-100	189.95	3	60-15	1.5	S	2	16.5	50	60	0	M	No	No	45	No	No	No	I	Yes		
	P-200	209.95	3	60-15	1.0	S	2	16.5	50	60	5	M	No	No	45	No	No	No	I	Yes		
	P-300	229.95	3	60-15	1.0	S	2	16.5	50	60	5	M	No	B	50	Yes	No	Yes	I	Yes		
	P-400	259.95	3	60-15	1.0	S	2	16.5	50	60	5	M	No	B	50	Yes	No	Yes	I	Yes		
	P-500	269.95	3	60-15	1.0	Both	2	16.5	50	60	5	M	No	B	50	Yes	No	Yes	I	Yes		
	PER-600	249.95	3	60-12.5	2.0	S	1	19.5	60	58	12	A	M	No	B	48	Yes	No	Yes	I	Yes	
	PER-700	299.95	10	60-12.5	2.0	S	2	19.5	60	58	12	A	M	No	D	48	Yes	No	Yes	I	Yes	
	PER-1000	359.95	3	60-15	1.0	Both	2	15.0	60	60	12	C	M	No	B	50	Yes	No	Yes	I	Yes	
	PER-1100	499.95	12	60-15	1.0	Both	2	13.5	65	60	12	C	M	No	B/D	50	Yes	Yes	Yes	I	Yes	
	PER-3000	499.95	12	60-15	1.0	S	2	13.5	65	60	12	C	M	No	B/D	50	Yes	No	Yes	D	Yes	
	PS-1500	499.95	12	60-15	1.0	S	2	13.5	65	60	12	C	M	No	B/D	50	Yes	No	Yes	D	Yes	
	PS-2000	199.95	10	60-12	2.0	Both	1	20.2	60	58	5	A	M	No	B	50	No	No	Yes	I	Yes	
	PS-4000	269.95	10	60-12	2.0	Both	2	20.2	60	58	5	A	M	No	B	50	Yes	No	Yes	I	Yes	
AUDIOVOX	AVX210	325.00	20			S	5	12	65		12	C	M	No	D	59	Yes	No	Yes	D	Yes	
	AVX200	275.00	7			S	1	12	65		12	C	M	No		50	Yes	No	No	D	Yes	
	AVX989	288.00	20			S	5	12	65		12	C	M	No		50	Yes	No	No	I	Yes	
	AVX205	200.00	5			S	1	12	65		12	A	M	No		50	No	No	No	D	Yes	
	AVX987	225.00	20			S	5	12	65		12	A	M	No		50	No	No	No	I	Yes	
	AVX960	350.00	25			S	2	12	65		12	A	M	No	B	59	Yes	Yes	Yes	I	Yes	
	AVX935	230.00	7			S	1	12	65		12	A	M	No		50	Yes	No	No	I	Yes	
	AVX931	182.00	7			S	1	12	65		12	A	M	No		50	No	No	No	I	Yes	
	AVX932	150.00	5			S	1	12	65		12	A	M	No		50	No	No	No	I	Yes	
	AVX3500	200.00	20			S	2	14	60		5	M	No	D	59	Yes	No	No	I	Yes		
	AVX686	155.00	20			S	5	14	60			M	No		50	No	No	No	I	Yes		
AVX3050	125.00	7			S	1	14	60			M	No		50	Yes	No	No	I	Yes			
AVX3000	90.00	7			S	1	14	60			M	No		50	No	No	No	I	Yes			
AUTOTEK	5770	399.95	4	20-20	1.0	Both	2	17.6	65	60	12	A	M	No	B/D	65	Yes	Yes	Yes	D	No	
	SR-100	249.95	3.5	20-20	0.5	Both	2	20	65	64	12	C	M	No	B	62	Yes	Yes	Yes	I	No	
	SR-90	149.95	3.5	20-20	0.5	S	2	20	65	64	12	C	M	No		62	Yes	No	Yes	I	No	
	2100	159.95	5	20-20	8.0	Both	2	17.6	65	55	0	C	M	No	No	45	Yes	No	No	I	No	
	5100	219.95	4	20-20	1.0	S	2	17.6	65	60	12	C	M	No	No	55	No	No	No	I	No	
	5200	264.95	4	20-20	1.0	Both	2	17.6	65	65	12	C	M	No	No	55	Yes	No	No	I	No	
	5300	299.95	4	20-20	1.0	Both	2	17.6	65	65	12	C	M	No	B	55	Yes	No	Yes	I	No	
5670	329.95	4	20-20	1.0	Both	2	17.6	65	65	12	C	M	No	B	55	Yes	No	Yes	D	No		
AUTOVOX	AX 1020	650.00			0.5	P	2	23	65	60	18	C	A	No	B	60	Yes	No	No	D/E	Yes	
	AX 1010	520.00	6	50-14	0.5	S	1	23	65	60	18	C	A	No		50	Yes	No	No	D/E	Yes	
	AX 830	420.00	6	50-10	0.5	S	1	23	60	60			No		50	No	No	No	D/E	Yes		
	AX 821	399.00	6	50-10	0.5	S	1	23	60	60			No	D	60	No	Yes	No	D/E	Yes		
	AX 820	320.00	6	50-10	0.5	S	1	23	60	60			No		50	No	No	No	D/E	Yes		

RADIOS/TAPE PLAYERS

MANUFACTURER	Model	Price, \$	AMPLIFIER										RADIO						TAPE			
			Average Watts/Channel, per EIA RS-439	Power Bandwidth, Hz to kHz, per EIA RS-439	THD at Rated Output, % per EIA RS-439	Outputs: Preamp (P), Speaker Level (S), Both (Both)	Number of Taps or EQ Controls	FM Sensitivity, dB (For 30-dB Quieting)	Antenna-Channel Selectivity	FM S/N Ratio, dB	Total Number of Station Presets	Tuning: Steep (A), Scan (B), Both (C)	Local/Variant Control: Manual (M), Automatic (A)	AM Stereo Capable? See Code	Noise-Reduction Circuit? See Code	Tape S/N Ratio, dB (With MP if Applicable)	Auto Reverse?	Program Search?	Tape EQ Switch?	In-Deck (I), Out-Deck (O), Under-Deck (U), Removable (C), Erasable (E)	Application Guide Available?	
			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
BLAUPUNKT	Frankfurt	159.95	7.5	80-20	1	Both	2	14.5	60	10	M	No	D	No	No	No	C	Yes				
	Frankfurt SQM36	249.95	7.5 x 4	80-20	1	Both	2	15	75	63	24	C	A	No	No	No	C	Yes				
	Denver SQR26	229.95	7.5	80-20	1	S	2	15	65	63	12	A	M	No	D	63	Yes	No	C	Yes		
	Aspen	249.95	7.5	80-20	1	S	1	14.5	60	12	A	M	No	D	63	Yes	No	C	Yes			
	Aspen SQR24	299.95	7.5	80-20	1	Both	2	14.5	60	12	A	M	No	D	63	Yes	No	C	Yes			
	Portland SQR26	299.95	7.5	80-20	1	Both	2	15	75	70	12	A	A	No	D	63	Yes	No	D	Yes		
	Sacramento	349.95	7.5	80-20	1	Both	2	19	60	12	A	M	No	D	60	Yes	No	C	Yes			
	Tucson	429.95				P	2	14.5	65	60	12	A	M	No	B	63	Yes	Yes	C	Yes		
	Lexington SQR46	429.95	16 x 2, 5 x 4	80-20	1	Both	2	22	78	65	12	C	A	No	B/D	62	Yes	Yes	D	Yes		
	Houston	529.95				P	2	14.5	65	60	12	A	M	No	B	63	Yes	Yes	C	Yes		
	Washington SQR34	529.95	7.5 x 4	80-20	1	S	2	20	78	65	12	A	M	No	B	70	Yes	No	D	Yes		
	Los Angeles	529.95	7.5	80-20	1	S	2	22	74	65	12	C	M	No	B	65	Yes	No	D	Yes		
	New York SQR05	599.95				P	2	20	78	65	18	A	M	No	B	70	Yes	Yes	D	Yes		
	Berlin SQR83	1850.00	20 x 4	80-20	1	P	2	20	78	65	16	A	M	No	B	70	Yes	Yes	D	Yes		
CARVER	TX-Nine	775.00						13	68	74	30	C	A		B/C	65	Yes	Yes	Yes	D/E		
	TX-Seven	650.00						15	60	68	30	C	A		B	60	Yes	Yes	Yes	D/E		
CLARIDN	4300R	129.95	3.2	50-20	5	S	1	12	70	65	0	A	No	No	50	No	No	No	I	Yes		
	4350R	129.95	3.2	50-20	5	S	1	12	70	65	0	A	No	No	50	No	No	No	I	Yes		
	4700R	159.95	3.2	50-20	5	S	1	12	70	65	5	A	No	No	50	No	No	No	I	Yes		
	4750R	159.95	3.2	50-20	5	S	1	12	70	65	5	A	No	No	50	No	No	No	I	Yes		
	6300R	189.95	3.2	50-20	5	S	2	12	70	65	5	A	No	No	53	Yes	Yes	No	I	Yes		
	6350R	189.95	3.2	50-20	5	S	2	12	70	65	5	A	No	No	53	Yes	Yes	No	I	Yes		
	8200R	189.95	3.2	50-20	5	S	1	12	70	65	18	A	A	No	53	No	No	No	I	Yes		
	8300R	219.95	3.2	50-20	5	S	1	12	70	65	18	A	A	No	53	Yes	No	No	I	Yes		
	8400RT	249.95	3.2	50-20	5	Both	2	12	70	65	18	A	A	No	53	Yes	No	No	I	Yes		
	8600RT	269.95	3.2	50-20	5	Both	2	12	70	65	18	A	A	No	53	Yes	Yes	Yes	I	Yes		
	8625RT	289.95	3.2	50-20	5	Both	2	12	70	65	18	A	A	No	53	Yes	Yes	Yes	D	Yes		
	8725RT	309.95	3.2	50-20	5	Both	2	12	70	65	10	A	A	No	B	63	Yes	Yes	Yes	I	Yes	
	8800RT	299.95	3.2	50-20	5	Both	2	12	70	65	18	A	A	No	B	63	Yes	Yes	Yes	I	Yes	
	8900RT	359.95	3.2	50-20	5	Both	2	12	70	65	18	A	A	M	B/C	71	Yes	Yes	Yes	I	Yes	
	8925RT	379.95	3.2	50-20	5	Both	2	12	70	65	18	A	A	M	B/C	71	Yes	Yes	Yes	D	Yes	
9425RT	569.95	11.0	50-20	1	Both	2	12	70	65	18	A	A	M	B/C	71	Yes	Yes	Yes	D	Yes		
CDNCORD	HPL-550	499.95	12 x 2, 5 x 4	20-20	0.8	Both	3	11.2	70	70	18	B	A	M	A/B/C	80	No	Yes	Yes	I	No	
	HPL-540	399.95	12	30-18	0.8	Both	2	12.5	63	62	12	B	A	No	B/C	70	Yes	Yes	Yes	D	No	
	HPL-520	379.95	12	20-20	0.8	Both	2	11.2	70	70	12	B	A	No	B/C	70	No	Yes	Yes	I	No	
	HPL-518	349.95	12	30-17	0.8	Both	2	11.2	70	70	12	B	A	No	B	60	Yes	Yes	Yes	I	No	
	HPL-516	269.95	12 x 2, 5 x 4	20-20	0.8	Both	3	11.2	70	70	0	B	A	No	B	58	No	Yes	Yes	I	No	
	HPL-117	299.95	5	30-17	0.8	Both	2	11.2	70	70	12	B	A	No	B	60	Yes	No	Yes	I	No	
COUSTIC	RX-512	279.95	25	30-20	0.9	Both	2	20	60	65	12	B	M	No	B/C	70	Yes	Yes	Yes	I		
	RX-506	229.95	6	30-20	0.9	Both	2	20	60	65	12	B	M	No	B/C	70	Yes	Yes	Yes	I		
	RX-504	159.95	25	50-20	0.9	Both	2	25	50	55			No	B	75	Yes	No	Yes	I			
CRAIG	T504	79.95	3.5	150-20	0.05	S	1	22.1	55	60			M	No	50	No	No	No	I	Yes		
	T505	99.95	3.5	150-20	0.05	S	1	16.8	55	55			M	No	50	No	No	No	I	Yes		
	T506	119.95	3.5	150-20	0.05	S	1	16.1	55	55			M	No	50	No	No	Yes	I	Yes		
	T562	229.95	3.2	90-20	0.05	Both	2	20.5	60	55		B	No	55	Yes	No	No	I	Yes			
	T722	179.95	3.5	90-20	0.05	S	1	23.0	60	60	6	A	M	No	50	Yes	No	No	I	Yes		
	T723	209.95	12	70-20	0.05	S	2	24.1	60	60	6	A	M	No	B	50	Yes	No	No	I	Yes	
	T724	249.95	12	70-20	0.05	S	2	24.7	60	60	6	A	M	No	B	50	Yes	Yes	No	I	Yes	
	T725	139.95	3.2	90-20	0.05	S	1	19.2	60	55	5	A	A	No	B	50	No	No	No	I	Yes	
CYBERNET	CMS-3000	499.00	18		10	Both	2	14.8	60	60	12	C	M	No	B	59	Yes	No	Yes	U	No	
DENON	DCR-5420	429.95	9	20-20	0.8	Both	2	14.8	70	60	24	A	M	No	B/C	72	Yes	Yes	Yes	D/E		
	DCR-5500	525.00	5	20-20	0.8	Both	2	14.8	70	60	12	A	M	No	B/C	72	Yes	Yes	Yes	D		
	DCR-7600	625.00				P	2	14.8	70	60	12	A	M	No	B/C	72	Yes	Yes	Yes	D		
EPI	LSR-42	429.95	12	50-20	0.8	Both	2	10.3	60	60	12	B	M	No	B/C	72	Yes	Yes	Yes	I		
	LSR-34	369.95	12	50-20	0.8	Both	2	11.2	60	60	12	B	A	No	B	60	Yes	Yes	Yes	I		
	LSR-24	269.95	8	50-20	0.8	Both	2	14.7	55	60	12	C	A	No	B	60	Yes	Yes	Yes	I		
	LSR-20	219.95	8	50-20	0.8	S	2	14.7	55	60	12	C	M	No	D	56	Yes	No	Yes	I		
FUJITSU TEN	4830	399.95	10	40-15	3	Both	2	15	64	65	10	A	M	B	55	Yes	Yes	Yes	D	Yes		
	H2	289.95	4	50-15	5	Both	2	15	60	65	10	A	M	B	60	Yes	Yes	Yes	D	Yes		
	H1	239.95	4	50-15	5	Both	1	15	60	65	10	A	M	B	53	Yes	Yes	Yes	D	Yes		
	L3	319.95	7	50-15	5	S	1	15	60	65	10	A	M	B	53	Yes	Yes	Yes	I	Yes		
	L2	299.95	15	50-15	3	Both	2	15	60	65	10	A	M	D	53	Yes	Yes	Yes	I	Yes		
	L1	259.95	5	50-15	5	Both	2	15	60	65	10	A	M		53	Yes	Yes	Yes	I	Yes		

If you can't afford it, spare yourself the heartache of listening to it.

We are all aware that money aside, it is an easy matter to upscale our quality of life, but difficult to lower it. In this regard, ignorance is bliss and strict abstinence is sometimes better than a taste of something finer that we can't have. So it is with Concord high-fidelity, high performance car audio. One listen, one taste, will significantly alter your demands for mobile high-fidelity.

Uncompromising performance; the Concord story begins and ends with it. Concord's performance engineering over the years has resulted in a list of mesmerizing characteristics that, as you become aware of them, will change your perception of car stereo.

For instance. A sound critic's claim is the best they've ever heard in a car stereo—home high-fidelity sound. Superb stereo imaging, wide band frequency response, and very low distortion levels are just some of the qualities of Concord's exclusive Matched Phase Amorphous Core Tape Head.

Electronic DC Servo tape drive for extended life and accurate control of tape speed. A cleaner sounding FM than you ever believed possible, thanks to the exclusive Concord FNR FM noise reduction system. High powered inboard amplifiers—rated at 50 watts—and the ability to simply plug in external amplifiers for additional power.

A few of the features found in the HPL 540 shown here are: Dolby B and C noise reduction systems, tuner/tape switch, tape search, and the smooth convenience of full logic tape controls. The ergonomic design insures easy operation of all functions.

One listen to all of this and you will be exhilarated, and if you've read this far you are no longer blissfully unaware. Your taste has been improved. If you can afford it, you already deserve, and probably demand the best in design, engineering and of course—uncompromising performance.



CONCORD[®]
Anything else is a compromise.

Concord Systems, Inc. 6025 Yolanda Avenue
Tarzana, CA 91356-0010 A Penril Company

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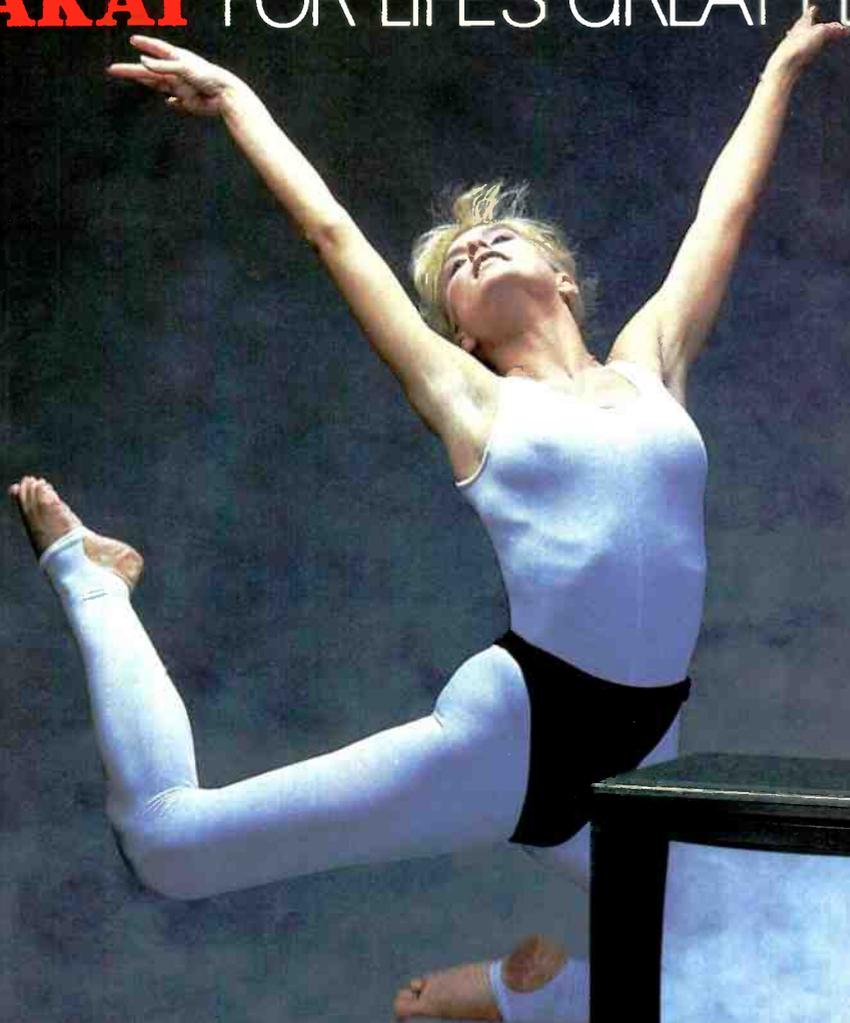
RADIOS/TAPE PLAYERS

MANUFACTURER	Model	Price, \$	AMPLIFIER										RADIO						TAPE																			
			Average Watts/Channel, per EIA RS-490		Power Bandwidth, Hz to kHz, per EIA RS-490		TRFD at Rated Output, % per EIA RS-490		Outputs: Preamp (P), Speaker Level (S), Both (Both)		Number of Tone or EQ Controls		FM Sensitivity, dB (For 30-dB Quieting)		Alternate-Channel Selectivity, dB		FM S/N Ratio, dB		Total Number of Station Presets		Location Control: Manual (M), Automatic (A)		AM Stereo Capable? See Code		Noise-Reduction Circuit?		Tape S/N Ratio, dB (With NR if Applicable)		Program Reverse?		Tape Search?		Tape ED Switch?		In-Dash (I), Out-In-Dash (O), Under-Dash (U), Convertible (C), Detachable (E)		Application Guide Available?	
			10	3	3	Both	2	12	70	72	12	C	M	No	D	D	72	No	Yes	Yes	Yes	D	Yes	Yes	D	Yes	Yes	D	Yes	Yes	D	Yes	Yes					
FULTRON	16-7700	250.00	10		3	Both	2				12	C	M	No	D	D		Yes <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td>	Yes <td>D</td> <td>Yes <td>Yes </td></td>	D	Yes <td>Yes </td>	Yes						
	16-7200	300.00	10		3	Both	2				12	C	M	No	D	D		Yes <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td>	Yes <td>D</td> <td>Yes <td>Yes </td></td>	D	Yes <td>Yes </td>	Yes						
	16-7400	200.00	10		3	Both	2				12	C	M	No	D	D		Yes <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td>	Yes <td>D</td> <td>Yes <td>Yes </td></td>	D	Yes <td>Yes </td>	Yes						
	16-6700	180.00	3		3	S	1				12	C	M	No	D	D		Yes <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td>	Yes <td>D</td> <td>Yes <td>Yes </td></td>	D	Yes <td>Yes </td>	Yes						
	16-5700	130.00	10		3	Both	2				0	C	M	No	D	D		Yes <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td>	Yes <td>D</td> <td>Yes <td>Yes </td></td>	D	Yes <td>Yes </td>	Yes						
	16-5300	110.00	3		3	Both	1				0	C	M	No	D	D		Yes <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td>	Yes <td>D</td> <td>Yes <td>Yes </td></td>	D	Yes <td>Yes </td>	Yes						
	16-5900	80.00	3		3	S	1				0	C	M	No	D	D		Yes <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td>	Yes <td>D</td> <td>Yes <td>Yes </td></td>	D	Yes <td>Yes </td>	Yes						
	16-5800	50.00	3		3	S	1				0	C	M	No	D	D		Yes <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td>	Yes <td>D</td> <td>Yes <td>Yes </td></td>	D	Yes <td>Yes </td>	Yes						
	16-5100	70.00	3		3	S	1				0	C	M	No	D	D		Yes <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td>	Yes <td>D</td> <td>Yes <td>Yes </td></td>	D	Yes <td>Yes </td>	Yes						
HARMAN/KARDON	CH161	625.00			P	2	2	14.8	70	72	12	B	M	No	B/C	72	No	Yes <td>Yes <td>Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes <td>Yes <td>D</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes <td>Yes <td>D</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td>	Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes <td>Yes <td>D</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td>	D	No	Yes <td>D</td> <td>No</td> <td>Yes <td>Yes <td>D</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td>	D	No	Yes <td>Yes <td>D</td> <td>No</td> <td>Yes <td>Yes </td></td></td>	Yes <td>D</td> <td>No</td> <td>Yes <td>Yes </td></td>	D	No	Yes <td>Yes </td>	Yes							
	CH160	495.00			P	2	2	14.8	70	70	12	C	M	No	B/C	70	No	Yes <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td>	I	No	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td>	I	No	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td>	I	No	Yes <td>Yes </td>	Yes							
	CH140	395.00			P	2	2	14.8	70	70	12	A	M	No	B	64	No	Yes <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td>	I	No	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td>	I	No	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td>	I	No	Yes <td>Yes </td>	Yes							
	CH120	275.00			P	2	2	14.8	55	70	12	A	M	No	B	64	No	Yes <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td>	I	No	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td>	I	No	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td>	I	No	Yes <td>Yes </td>	Yes							
HI-COMP	HCC-1060	199.95	3	100-15	1	Both	2	12	70	12	18	C	M	No	D	55	Yes <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td>	I	No	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td>	I	No	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td>	I	No	Yes <td>Yes </td>	Yes								
	HCC-1160	289.95	13	50-20	1	Both	2	12	70	18	18	C	M	No	D	58	Yes <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td>	I	No	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td>	I	No	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td>	I	No	Yes <td>Yes </td>	Yes								
	HCC-1260	369.95	13	50-20	1	Both	2	12	70	18	18	C	M	No	D	60	Yes <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td>	I	No	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td>	I	No	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td>	I	No	Yes <td>Yes </td>	Yes								
	HCC-2100	299.95	13	50-20	1	Both	2	12	70	18	18	C	M	No	D	58	Yes <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td>	I	No	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td>	I	No	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td>	I	No	Yes <td>Yes </td>	Yes								
	HCC-2250	399.95	15	50-20	1	Both	2	11	74	12	12	C	M	No	B	60	Yes <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td></td>	I	No	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td></td>	I	No	Yes <td>Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td></td>	Yes <td>I</td> <td>No</td> <td>Yes <td>Yes </td></td>	I	No	Yes <td>Yes </td>	Yes								
HITACHI	CSK350	349.95	20 x 2, 5 x 4	40-16	0.1	Both	5	16.3	80	60	12	B	A	No	B	58	Yes	No	Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes </td></td></td></td>	D	No	Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes </td></td></td>	D	No	Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes </td></td>	D	No	Yes <td>D</td> <td>No</td> <td>Yes </td>	D	No	Yes							
	CSK310	299.95	20 x 2, 5 x 4	40-16	0.1	Both	2	16.3	80	60	12	B	A	No	No	53	Yes	No	Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes </td></td></td></td>	D	No	Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes </td></td></td>	D	No	Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes </td></td>	D	No	Yes <td>D</td> <td>No</td> <td>Yes </td>	D	No	Yes							
	CSK270	249.95	20	40-16	0.1	S	1	16.3	80	60	12	B	A	No	No	53	Yes	No	Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes </td></td></td></td>	D	No	Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes </td></td></td>	D	No	Yes <td>D</td> <td>No</td> <td>Yes <td>D</td> <td>No</td> <td>Yes </td></td>	D	No	Yes <td>D</td> <td>No</td> <td>Yes </td>	D	No	Yes							
CSK250	184.95	20	40-16	0.1	S	2	16.3	80	60	10	A	M	No	No	53	No	No	No	D	No	Yes <td>C</td> <td>No</td> <td>Yes <td>C</td> <td>No</td> <td>Yes <td>C</td> <td>No</td> <td>Yes </td></td></td>	C	No	Yes <td>C</td> <td>No</td> <td>Yes <td>C</td> <td>No</td> <td>Yes </td></td>	C	No	Yes <td>C</td> <td>No</td> <td>Yes </td>	C	No	Yes								
	JENSEN	JXL-25	199.95	4	50-20	1.0	S	1	18.5	58	58	8	A	M	No		54	No	No	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes						
		JXL-35	229.95	4	50-20	1.0	S	1	18.5	58	58	8	A	M	No		54	No	No	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes						
JXL-45		274.95	4	50-20	1.0	Both	2	18.5	58	58	12	B	A	No		54	Yes <td>No</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td>	No	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
JXL-55		334.95	4	50-20	1.0	Both	2	18.5	58	58	12	B	A	No	B	62	Yes <td>No</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td>	No	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
RE900		199.95	4	50-20	2.5	S	1	14.8	60	12	12	B	A	No		50	No	No	No	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
RE920		224.95	4	50-20	2.5	Both	1	14.8	60	12	12	B	A	No		50	No	No	No	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
RE940		249.95	4	50-20	2.5	Both	2	14.8	60	12	12	B	A	No		50	Yes <td>No</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td>	No	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
XK962		274.95	4	50-20	2.5	Both	2	14.8	60	12	12	B	A	No		50	Yes <td>No</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td>	No	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
JSE	9527	149.95	10	20-18	1	Both	2	23	65	60		A	M	No	No	55	Yes	No	No	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
	9640	189.95	10	20-18	1	Both	1	23	70	60	10	A	M	No	No	60	Yes <td>No</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td>	No	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
	9650	229.95	10	20-18	1	Both	1	23	70	60	12	A	M	No	No	60	Yes <td>Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
	9660	249.95	10	20-18	1	Both	2	23	70	65	12	A	M	No	D	85	Yes <td>Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
	9670	279.95	25	20-18	1	Both	2	23	70	65	12	A	M	No	D	85	Yes <td>Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
JVC	KSR12	200.00	3	100-20	0.8	S	2	17.2	65	60	15	B	A	No		52	Yes	No	No	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
	KSR22	270.00	3	40-20	0.8	Both	2	16.3	65	60	15	B	A	No		60	Yes <td>Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
	KSRX250	320.00	8	40-20	0.8	Both	2	16.3	65	60	20	B	M	No	B	60	Yes <td>Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
	KSRX305	350.00	8	40-20	0.8	Both	2	16.3	65	60	20	B	M	No	B	60	Yes <td>Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
	KSRX450	360.00	8	40-20	0.8	Both	2	16.3	65	60	20	B	M	No	B	60	Yes <td>Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
	KSRX605	480.00	8	40-20	0.8	Both	5	16.3	65	60	20	B	M	No	B	60	Yes <td>Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
	KSRX710	500.00	12	40-20	0.8	Both	5	16.3	65	60	20	B	M	No	B	60	Yes <td>Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td></td>	I	Yes <td>I</td> <td>Yes <td>I</td> <td>Yes </td></td>	I	Yes <td>I</td> <td>Yes </td>	I	Yes							
KENWOOD	KRC-999	1499.00				P	7	18.0@50 dB	80	73	20	C	M	No	A/B/C	86	Yes <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td>	Yes <td>D</td> <td>Yes <td>Yes </td></td>	D	Yes <td>Yes </td>	Yes							
	KRC-929	799.00				P	2	18.4@50 dB	80	70	24	C	M	No	A/B/C	86	Yes <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td>	Yes <td>D</td> <td>Yes <td>Yes </td></td>	D	Yes <td>Yes </td>	Yes							
	KRC-838	639.00	9	20-20	1	Both	2	19.0@50 dB	65	70	24	C	M	No	B/C	73	Yes <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	D/E	Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td></td></td></td>	D/E	Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td></td>	D/E	Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td>	Yes <td>D/E</td> <td>Yes <td>Yes </td></td>	D/E	Yes <td>Yes </td>	Yes							
	KRC-636	539.00	4	20-20	1	Both	2	19.0@50 dB	65	70	24	C	M	No	B/C	73	Yes <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	D/E	Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td></td></td></td>	D/E	Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>D/E</td> <td>Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td></td>	D/E	Yes <td>Yes <td>D/E</td> <td>Yes <td>Yes </td></td></td>	Yes <td>D/E</td> <td>Yes <td>Yes </td></td>	D/E	Yes <td>Yes </td>	Yes							
	KRC-424	359.00	4	20-20	1	Both	2	18.4@50 dB	65	69	12	A	M	No	B	62	Yes <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>D</td> <td>Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td></td>	D	Yes <td>Yes <td>D</td> <td>Yes <td>Yes </td></td></td>	Yes <td>D</td> <td>Yes <td>Yes </td></td>	D	Yes <td>Yes </td>	Yes							
	KRC-8001	579.00	10	20-20	1	Both	2	18.4@50 dB	65	70	24	C	M	M	B/C	73	Yes <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	I	Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td></td>	I	Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td>	I	Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td>	Yes <td>I</td> <td>Yes <td>Yes </td></td>	I	Yes <td>Yes </td>	Yes							
	KRC-6000	449.00	10	20-20	1	Both	2	19.0@50 dB	65	70	12	A	M	No	B/C	68	Yes <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	I	Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td></td>	I	Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td>	I	Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td>	Yes <td>I</td> <td>Yes <td>Yes </td></td>	I	Yes <td>Yes </td>	Yes							
	KRC-4000	349.00	4	20-20	1	Both	2	19.0@50 dB	65	70	12	A	M	No	B	64	Yes <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td></td>	Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td></td></td></td>	I	Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td></td>	I	Yes <td>Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td></td>	Yes <td>I</td> <td>Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td></td>	I	Yes <td>Yes <td>I</td> <td>Yes <td>Yes </td></td></td>	Yes <td>I</td> <td>Yes <td>Yes </td></td>	I	Yes <td>Yes </td>	Yes							

RADIOS/TAPE PLAYERS

MANUFACTURER	Model	Price, \$	AMPLIFIER										RADIO										TAPE			
			Average White Channel, per EIA RS-439	Power Bandwidth, Hz to kHz, per EIA RS-439	THD at Rated Output, % per EIA RS-439	Outputs, Preamp (P), Speaker Level (S), Both (Both)	Number of Tone or EQ Controls	FM Sensitivity, dB (For 30-dB Quieting)	Alternate Channel Selectivity, dB	FM S/N Ratio, dB	Total Number of Station Presets	Tuning: Seek (A), Scan (B), Both (C)	Local/Variant Control: Manual (M), Automatic (A)	AM Stereo Capable? See Code	Noise-Reduction Circuit? See Code	Tape S/N Ratio, dB	Auto Reverse?	Program Search?	Tape EQ Switch?	In Deck (I), DIN (in Deck (D)), User-Deck (U), Convertible (C), Extractable (E)	Application Guide Available?					
LIRPA LABS	CarCass	19.95	8 1/2 x 11	9-5	3.14	None	76	99 @ 5 dB	5	15	99	Q	X	Q	E	23	Sel.	Yes	Yes	Yes	Yes	U/E	Maybe			
MAGNADYNE	LS1001 M3175 M3100 M3090 M3080	269.95 239.95 189.95 169.95 139.95	25 15 7 7 7	40-18 50-17 50-17 50-17 50-17	1 1 1 1 1	Both Both S S S	2 2 1 1 1	15.0 20.0 20.0 20.0 20.0	50 48 48 48 48	52 50 50 50 50	6 6 6 6 5	C C C C A	M M M M M	No No No No No	B B No No No	62 59 50 50 50	Yes Yes No No No	Yes Yes No No No	Yes Yes No No No	Yes Yes No No No	D I I I I	No No No No No				
MAGTONE	1100 1060 1040 1020	599.95 399.95 299.95 245.95	7 7 7 7	30-15 30-16 30-16	0.005 0.005 0.005 0.01	P Both Both Both	3 2 2 1	15 @ 50 dB 17 @ 50 dB 17 @ 50 dB 17 @ 50 dB	80 80 70 70	70 65 55 50	12 12 12 12	B B B B	M M M M	No No No No	A/B/C D D D	63 63 60 50	Yes Yes Yes Yes	Yes Yes No No	Yes Yes Yes No	Yes Yes Yes No	I I I I	No No No No				
MAJESTIC	MCR 4800 MCR 84-200 MCR 4100 MCR 450 DAN MCR 84-900 MCR 84-400	199.95 139.95 169.95 169.95 229.95 129.95	25 7 7 7 25 7	50-15 40-18		Both Both Both S Both Both	3 3 3 3 3 3	25.2 19.2 19.4 19.4 19.2	75 30 30 50 50 50	12 12 12 12 12	C C C C C C	M M M A M M	No No No No No M	B B No No No B	50 45 50 45 55 45	Yes Yes Yes Yes Yes Yes	No No No No No Yes	Yes Yes No No Yes Yes	Yes Yes No No Yes Yes	I I I I I I	No No No No No No					
MANSOOR	CX118M CX119M CX117M CX139M CX132M CX141P CX136M CX142E CX145E CX147E CX157E CX177E CX180E	69.95 79.95 89.95 129.95 129.95 159.95 169.95 159.95 179.95 219.95 299.95 399.95 499.95	2.5 2.8 2.8 2.9 12.4 2.9 12.4 2.5 2.5 2.5 12.5 12.5 2.8 x 4	100-10 40-12 40-12 35-14 50-14 35-14 50-14 40-18 40-12 40-12 20-18 40-18 30-17	0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	S S S Both S Both S S Both Both Both Both Both	1 1 1 2 5 2 2 2 2 2 2 2 2	22 19 19 16.5 21.5 21.5 61 55 55 19 52 52 52	70 70 70 50 61 50 61 55 55 54 52 52 52	59 30 30 32 38 32 38 50 58 30 30 30 64		M M M M Yes Yes Yes Yes Yes Yes Yes Yes	No No No No No No No No No No No No No	B B B B B B B B B D D B/C D	50 46 46 50 50 50 50 50 52 60 59 63 62	No No No Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	No No No No No No No No No Yes Yes Yes Yes	No No No Yes Yes Yes Yes Yes Yes Yes Yes Yes Auto	I I I I I I I I I I I I D	No No No No No No No No No No No No No						
MARANTZ	CAR335 CAR500 CAR750	139.95 179.95 279.95	3.8 5.5 20			Both S Both	2 2 2				12 12	A A A	M M M	No No No	B	Yes Yes Yes	Yes Yes Yes	Yes Yes Yes	Yes Yes Yes	I I I	No No No					
METRO SOUND	CS1100 CS825 CS500 CS811	489.95 299.95 269.95 289.95	7 20 7 6	10 10 10 10		Both Both Both Both	2 2 2 2		60 60 60 60	65 64 64 64	12 12 12 12	C C C C	M M M M	No No No No	D B No No	80 82 80 80	Yes Yes Yes Yes	Yes Yes No Yes	Yes Yes No Yes	Yes Yes Yes Yes	C I I I	Yes Yes Yes Yes				
MITSUBISHI	JX-3 JX-2 MX-4 MX-3 MX-2 CZ-741 (Only with CD player) RX-740 RX-734 RX-731 RX-722	360.00 280.00 350.00 250.00 200.00 280.00 200.00 160.00 80.00	13 x 4 17 13 3.5 3.5 3.5 3.5 3.5	70-20 70-20 70-20 100-10 100-10	1 1 1 1 1	S S Both Both Both P	6 3 3 3 3 3	14 14 14 14 14 14	65 65 65 65 65 65	60 60 18 15 15 10	18 18 18 15 15 10	C C C A A C	M M M M M A	M M M No No No	B B B B B B	62 62 70 62 52 62	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes No Yes	I I I I I I	Yes Yes Yes Yes Yes Yes					
NAKAMICHI	TD-1200II TD-800 TD-700 TD-500 TD-400 TD-300	1260.00 890.00 790.00 595.00 475.00 390.00				P P P P P	3 3 3 3 2	20 20 18 18 20 20	60 60 65 65 65 65	65 65 12 10 12 10	10 10 10 10 10	A A B B A A	A A M M M M	No No No No No No	B C C C B C	70 70 70 70 70 68	Yes No No No Yes No	No Yes Yes Yes Yes No	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	I D D D D D	No No No No No No				
PANASONIC	CO-E330 CO-E280 CO-S550 CO-S515 CO-S505 CO-E401 CO-E650 CO-E400 CO-E370 CO-E352 CO-E402 CO-E302 CO-E452 CO-S525 CO-S535	199.95 179.95 319.95 189.95 99.95 259.95 529.95 269.95 229.95 269.95 329.95 229.95 359.95 199.95 249.95	3 3 14 3 3 3 18 14 3 3 14 3 14 3 14	70-40 70-40 30-20 70-40 70-40 70-40 40-30 20-40 70-40 70-40 30-20 70-40 30-20 70-40 70-40	3.0 3.0 3.0 3.0 3.0 3.0 0.08 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	S S S S S Both Both S S Both Both Both S S	2 2 2 2 2 1 2 2 2 2 2 2 2 2 2	15 15 15 15 15 15 15 15 15 15 15 15 15 15 15	75 75 75 75 55 75 75 75 75 75 75 75 75 75 75	65 65 70 70 0 70 70 70 70 70 70 70 70 70 70	10 10 10 10 0 10 12 10 10 12 10 12 10 10	A A C A A A C A A C C C A A	A A No A A A No A A A A A A A	No No B No No B A/B/C B B B B B B No	52 52 62 52 50 62 88 62 52 62 62 52 62 52 52	Yes No Yes No Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	No Yes Yes No No Yes Yes Yes Yes Yes Yes Yes Yes No	Yes Yes Yes No No Yes Yes Yes Yes Yes Yes Yes Yes Yes	Yes No Yes No No Yes Yes Yes Yes Yes Yes Yes Yes Yes	I I I I I I I I I I I I I I	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes					

AKAI FOR LIFE'S GREAT PERFORMANCES.™



Picture this: Two new audio-video standouts with talents second-to-none.

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RADIOS/TAPE PLAYERS

MANUFACTURER	Model	Price \$	AMPLIFIER										RADIO						TAPE			
			Average Watts Channel, Per EIA RS-199	Power Bandwidth, Hz to kHz, per EIA RS-199	THD at Rated Output, % per EIA RS-199	Output, Preamp (P), Speaker Level (S)	Number of Tones or EQ Controls	FM Sensitivity, dB (For 30-dB Quieting)	Alternate-Channel Selectivity, dB	FM S/N Ratio, dB	Total Number of Station Presets	Tuning: Seek (A), Scan (B), Both (C)	Local/Distant Control: Manual (M), Automatic (A)	AM Stereo Capable? See Code	Noise-Reduction Circuit? See Code	Tape S/N Ratio, dB (With NR If Applicable)	Auto Reverse?	Program Search?	Tape EQ Switch?	in Dash (D), DM (in Dash ID), User-Dash (U), Convertible (C), Extractable (E)	Application Guide Available?	
SHARP	RG-B914	270.00	11	50-20	1	S	0	14.1		56	12	A	No	M	B	62	Yes	Yes	Yes	I	Yes	
	RG-B908	250.00	11	50-20	1	S	0	14.1		56	12	A	No	No	B	62	Yes	Yes	Yes	I	Yes	
	RG-F864	350.00	11	50-20	1	S	5	14.1		56	10	C	A	No	B	64	Yes	Yes	Yes	D	Yes	
	RG-F870	400.00	11	50-20	1	S	5	14.1		56	10	C	A	No	B	64	Yes	Yes	Yes	D	Yes	
SHERWOOD	CRD 95	169.95	3.5	40-20	0.5	P	2	20.7	65	65	0		M	No	B	62	Yes	No	Yes	I	Yes	
	CRD 101	189.95	12	40-20	0.5	P	2	20.7	65	65	0		M	No	B	53	Yes	No	Yes	I	Yes	
	CRD 180	249.95	3.5	40-20	0.5	P	2	14.8	65	65	12	C	M	M	B	62	Yes	No	Yes	I	Yes	
	CRD 301	299.95	12	40-20	0.5	P	2	17.3	65	62	12	C	M	M	B	62	Yes	No	Yes	I	Yes	
	CRD 165	169.95	3.5	40-20	0.5	P	2	18	65	64	12	C	M	M	No	62	Yes	No	Yes	I	Yes	
	CRD 210	259.95	3.5x4	40-20	0.5	Both	2	14.8	65	65	12	C	M	M	B/C	71	Yes	Yes	Yes	I	Yes	
	CRD 350	299.95	3.5x4	40-20	0.5	Both	2	20.7	65	64	12	C	M	M	B/C	71	Yes	Yes	Yes	I	No	
SONY	XR-900	599.95				P	2	15	75	65	18	B	M	No	B/C	75	Yes	Yes	Yes	D	Yes	
	XR-787R	449.95	11 x 4	30-20	1.0	Both	3	15	70	65	18	C	M	No	B	66	Yes	Yes	Yes	D	Yes	
	XR-747R	349.95	11	30-20	1.0	Both	3	15	65	65	18	C	M	No	B	58	Yes	Yes	Yes	D	Yes	
	XR-80	429.95				P	2	15	70	66	18	B	M	No	B/C	75	Yes	Yes	Yes	I	Yes	
	XR-66	329.95	11	30-20	1.0	Both	2	15	70	65	18	B	M	No	B	66	Yes	Yes	Yes	I	Yes	
	XR-57R	299.95	11	20-30	1.0	Both	2	15	65	65	18	C	M	M	B	66	Yes	Yes	No	I	Yes	
	XR-A37R	279.95	11	20-30	1.0	Both	2	15	65	65	18	C	M	U	B	58	Yes	No	Yes	I	Yes	
	XR-47R	259.95	4	150-20	1.5	Both	2	15	65	65	18	C	M	No	B	66	Yes	No	Yes	I	Yes	
	XR-37R	249.95	11	20-30	1.0	Both	2	15	65	65	18	C	M	M	No	58	Yes	No	Yes	I	Yes	
	XR-27R	219.95	4	150-20	1.5	Both	2	15	65	60	18	C	M	No	B	58	Yes	No	Yes	I	Yes	
	XR-17	149.95	4	150-20	1.5	Both	3	15	65	63			A	No	B	55	Yes	No	No	I	Yes	
SOUNDSTREAM	TC 308	599.00				(4)P	3	13	65	67	12	B	M	No	B/C	70	Yes	Yes	Yes	D/E	No	
	TC 305	469.00				(4)P	3	13	65	67	12	B	M	No	B/C	70	Yes	No	Yes	D/E	No	
SPARKOMATIC	SR307	139.95	20	20-20	0.10	S	5	23.3	65	60		No	A	No	D	50	Yes	No	Yes	I	Yes	
	SR305	99.95	20	20-20	0.10	S	5	23.3	65	38		No	A	No	No	38	No	No	No	I	Yes	
	SR334	89.95	5	70-10	0.10	S	1	29.3	65	60		No	A	No	No	35	No	No	No	I	Yes	
	SR31	79.95	5	75-10	0.10	S	1	29.3	40			No	A	No	No	No	No	No	No	I	Yes	
	SR36	69.95	5	75-10	0.10	S	1	32.8	45	60		No	A	No	No	No	No	No	No	I	Yes	
	SR300	49.95	5	75-10	0.10	S	1	29.3	45			No	A	No	No	No	No	No	No	I	Yes	
	SR430	249.95	20	20-20	0.10	S	5	25.2	65	60	10	C	M	M	D	65	Yes	Yes	Yes	I	Yes	
	SR425	159.95	20	20-20	0.10	S	1	14.7	65	60	20	C	A	M	D	65	No	No	Yes	I	Yes	
	SR420	139.95	5	70-12	0.10	S	1	28.1	65	60	10	A	A	M	No	60	Yes	No	No	I	Yes	
	SR315	299.95	20	20-20	0.10	S	5	14.7	65	60	10	C	A	A	No	B/C/D	76	Yes	Yes	Yes	I	Yes
	SR308	179.95	20	20-20	0.10	S	2	23.3	65			D	C	M	No	60	Yes	No	Yes	I	Yes	
	SR314	119.95	5	70-12	0.10	S	1	20.8	55	60	10	A	A	A	No	No	No	No	No	I	Yes	
	SR338	99.95	5	70-12	0.10	S	1	20.8	50			D	C	A	No	55	No	No	No	I	Yes	
	SR317	199.95	20	20-20	0.10	S	5	23.3	60	60	10	C	A	A	No	60	Yes	No	No	I	Yes	
SR35	29.95	5	75-10	0.10	S	1	32.8	45			D	C	A	No	35	No	No	No	I	Yes		
SUNKYONG	SIR-7900	229.95							50	55	12	C		M	D	40	Yes	Yes		I	Yes	
	SIR-7000	199.95									12	C		No	D	50	Yes	Yes		I	Yes	
	SIR-6200	188.00									12	C		No	D	40	Yes	No		I	Yes	
	SIR-5200	139.95									12	C		No	D	40	No	No		I	Yes	
	SA-200	245.00	100	20-20	0.05	S														I	Yes	
SA-130	155.00	65	20-20	0.05	S														I	Yes		
SA-80	125.00	40	20-20	0.05	S														I	Yes		
TECHNICS	CQ-R700	259.95	7.5			Both	2			70	10	C	M	No	B	62	Yes	No	Yes	I	Yes	
	CQ-R720	299.95	25x2, 12.5x4			Both	2			70	10	C	M	No	B	62	Yes	Yes	Yes	I	Yes	
	CQ-R7300	359.95	25x2, 12.5x4			Both	2			70	12	C	M	No	B	62	Yes	Yes	Yes	D	Yes	
	CQ-R7400	529.95	20x2, 25x2			Both	2			70	12	C	M	No	A/B/C	88	Yes	Yes	Yes	D	Yes	
	CQ-H7500	649.95				P	7			70	12	C	M	No	B/C	74	Yes	Yes	Yes	O	Yes	
ULTRX	UR50	320.00	10	50-20	0.01	Both	3	14.8	70		12	A	A	No	A/B	50	Yes	Yes	No	D	Yes	
	UR60	370.00	10	50-20	0.01	Both	3	14.8	70		12	A	A	No	A/B	50	Yes	Yes	No	D	Yes	
	UR70	420.00	15	50-20	0.003	Both	3	14.8	70		12	C	A	No	A/B/C	50	Yes	Yes	No	D	Yes	
	UR80	470.00	15	50-20	0.003	Both	3	14.8	70		18	C	A	No	A/B/C	50	Yes	Yes	No	D	Yes	
	UDR100	550.00	15	50-20	0.003	Both	3	14.8	70		18	C	A	No	A/B/C	50	Yes	Yes	No	D	Yes	
YAMAHA	YCR-950	600.00	18	30-16	1	Both	2	17.3	80	65	12	A	M	No	B/C	75	Yes	No	Yes	I	No	
	YCR-750	530.00	5	30-16	1	Both	2	17.3	80	65	10	A	M	No	B/C	75	Yes	No	Yes	I	No	
	YCR-550	400.00	18	30-16	1	Both	2	17.3	80	65	12	A	M	No	B/C	75	Yes	No	Yes	I	No	
	YCR-350	300.00	18	30-16	1	Both	2	17.3	80	65	12	A	M	No	B/C	75	Yes	No	Yes	I	No	
	YCR-150	250.00	6	30-16	1	Both	2	17.3	80	65	10	A	M	No	B	70	Yes	No	Yes	I	No	
	YCT-850	650.00	1		1	P	2	17.3	80	65	12	A	M	No	A/B/C	85	Yes	No	Yes	I	No	
	YCT-650	550.00	1		1	P	2	17.3	80	65	10	A	M	No	A/B/C	85	Yes	No	Yes	I	No	
	YCT-450	350.00	1		1	P	2	17.3	80	65	10	A	M	No	B/C	75	Yes	No	Yes	I	No	

SPEAKERS

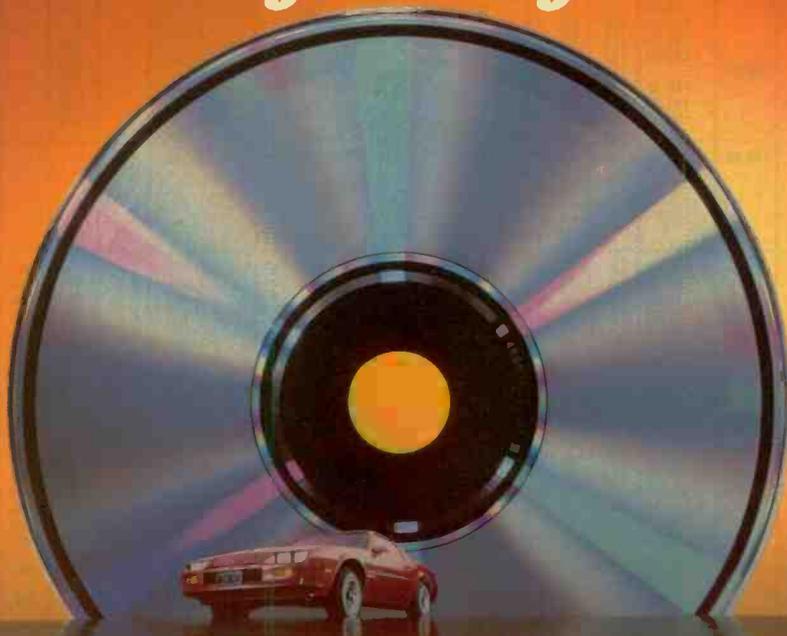
MANUFACTURER	Model	Price \$ (If Sold Individually)	Price \$ (If Sold in Pairs)	Recommended Maximum Power, Watts	Sensitivity, dB SPL (1 Watt/1 Meter)	Impedance, Ohms	Frequency Response, Hz to kHz, ±dB	DRIVERS										Notes
								Subwoofer Only (S) Woofer Only (W) Midrange Only (M) Tweeter Only (T)	Woofer Size, Inches	Whizzer (W), 2-way (2), 3-way (3), 4-way (4)	Agled Tweeter(s) = A, Foldable Tweeter(s) = P	Separately Mounted Drivers?	Flush Mount (F), Surface Mount (S), Concealable (C), Pole (P)	Maximum Required Mounting Depth, Inches	Weatherproofed?	Application Guide Available?		
ADS	200CC	280.00	50	88	4	85-20 ±3		4	2	P	No	S		No	No	Flush-mount kit optional. Includes crossover.		
	300CC	370.00	75	90	4	68-20 ±3		5 1/4	2	P	No	S		No	No			
	3001	290.00	100	90	4	50-20 ±3		5 1/4	2		No	P		1 1/2	Yes			
	3151	330.00	75	90	4	58-20 ±3		5 1/4	2	P	Yes	F, S		1 1/8	Yes			
	3201	430.00	100	91	4	58-20 ±3		5 1/4	2	P	Yes	F, S		1 1/8	Yes			
	CS700 System	270.00	100	91	4	30-150 Hz ±3	S	7 1/2						2 1/4	Yes			
AFS KRIKET	0003	55.95	60	91	4		W	5 1/4				F	2 1/2	Yes	No	For GM cars. For GM and Ford cars.		
	0004	85.95	90	92	4		W	6 x 9				F	3 3/4	Yes	No			
	2670	75	93	4		W	6 1/2					F	3 3/4	Yes	No			
	2870	80	93	4		W	8					F	3 3/4	Yes	No			
	2122	30	90	4		W	4 x 6	2				F	1 1/8	Yes	No			
	8976	179.95	100	96	4	35-22 ±4		6 x 9	3			F	3 3/4	Yes	No			
	8974	149.95	90	94	4	40-22 ±4		6 x 9	2			F	3 3/4	Yes	No			
	8936	108.00	70	4		45-22 ±3		6 x 9	3			F	3 1/4	Yes	No			
	8932	134.95	60	4		50-18 ±5		6 x 9	2			F	3 1/4	Yes	No			
	8931	79.95	60	4		55-15 ±5		6 x 9	2			F	3 1/4	Yes	No			
	8424	94.95	30	89	4	65-22 ±4		4	2			F	1 1/2	Yes	No			
	8422	71.95	30	89	4	65-18 ±5		4	2			F	1 1/2	Yes	No			
	8421	44.95	30	89	4	65-15 ±5		4	W			F	1 1/2	Yes	No			
	8234	111.95	50	93	4	60-22 ±4		5 1/4	2			F	2 1/2	Yes	No			
	8232	77.95	50	92	4	60-18 ±4		5 1/4	2			F	2 1/2	Yes	No			
	8231	77.95	50	92	4	60-15 ±4		5 1/4	W			F	2 1/2	Yes	No			
8074	127.95	60	93	4	55-22 ±4		4 x 10	2			F	3 1/8	Yes	No				
8032	79.95	60	93	4	60-18 ±4		4 x 10	2			F	2 1/2	Yes	No				
7311	36.95	30	89	4	80-18 ±4		3 1/2	W			F	1 1/8	Yes	No				
0002	65.95	75	92	4	5x-22k ±4	T						F	5/8	Yes	No			
AIWA	SC-X90	90.00	40	90	4	45-20		6 x 9	3		No		3	Yes	Yes			
	SC-X60	60.00	40	90	4	50-22		5 1/4	2		No		1 1/8	Yes	Yes			
	SC-X40	50.00	30	90	4	55-20		4	2		No		1 1/8	Yes	Yes			
ALPHASONIK	D-6200	75.00	50	4	4	70-25		4 1/2	2		No	P	1 1/2		No			
	D-6300	115.00	80	4	4	70-25		4 1/2	2		No	S			No			
	D-7200	117.50	75	4	4	45-25		5 1/4	2		Yes	C	2 1/4		No			
	WP-1230	62.50	100	4	4	20-2 ±4	W	12							No			
	WP-1030	57.50	100	4	4	30-2 ±4	W	10							No			
	WP-820	54.00	100	4	4	40-3 ±4	W	8				F		No	No			
	WP-6920G	54.00	100	4	4	40-3 ±4	W	6 x 9				F		Yes	No			
	SW-8030	56.00	75	4	4	40-2 ±4	W	8				F		No	No			
	SW-6025G	54.00	60	4	4	40-2.5 ±4	W	6				F		No	No			
	MP-55G	26.10	60	4	4	700-6 ±4	M					F			No			
	MDT-1	30.00	120	87	4	1.4k-20k	T				P				No			
	DT-40G	21.50	40	4	4		T								No			
ALPINE	6132	45.00	20	89	4	75-20 ±3		4 x 6	W			F			Yes			
	6148	50.00	20	89	4	70-20 ±3		4	W			S			Yes			
	6248	70.00	40	89	4	60-21 ±3		4	2			S			Yes			
	6243	70.00	40	90	4	55-20 ±3		4 x 6	2			S	1 3/4		Yes			
	6253	60.00	40	90	4	60-20 ±3		5	2			C			Yes			
	6269	200.00	100	92	4	45-23 ±3		6 1/2	2			C			Yes			
	6205	100.00	60	92	4	45-21 ±3		6 x 9	2			C	3 3/4		Yes			
	6392	120.00	60	94	4	50-21 ±3		6 x 9	3			C			Yes			
	6293	140.00	100	93	4	40-22 ±3		6 x 9	2			C	3 1/8		Yes			
	6393	190.00	100	93	4	40-22 ±3		6 x 9	3			C	3 1/2		Yes			
	6256	80.00	60	90	4	50-22 ±3		5 1/4	2			C			Yes			
	6210	90.00	60	90	4	50-22 ±3		4 x 10	2			S			Yes			
	6203	90.00	40	90	4	50-20 ±3		6 1/2	2			S			Yes			
	6362	110.00	60	91	4	50-21 ±3		6 1/2	3			S			Yes			
	6264	130.00	80	91	4	45-22 ±3		6 1/2	2			S			Yes			
	6399	300.00	100	94	4	35-23 ±3		6 x 9	3		A		C		Yes			
	6207	140.00	80	90	4	50-22 ±3		5 1/4	2			P	1 3/4		Yes			
	6307	80	90	4	4	40-23 ±3		5 1/4	3			P			Yes			
	6191	70.00	60	94	4	35-5 ±3	S	6 x 9				C	3 1/2		Yes			
	6170	90.00	100	90	4	35-10 ±3	S	7				C	3 3/8		Yes			
	6190	120.00	150	92	4	30-6 ±3	S	6 x 9				C	3 1/2		Yes			
	6491	60	93	4	4	50-1 ±3	S	6 x 9				C			Yes			
	6100	200.00	150	92	4	30-6 ±3	S	10				C	4 3/8		Yes			
6490	250.00	150	89	4	50-1.5 ±3	S	6 x 9				C			Yes				
6040	70.00	60	91	4	100-16 ±3	M					S			Yes				
6010	100.00	40	92	4	2k-23k ±3	T				A		S		Yes				
6060	90.00	80	90	4	50-10 ±3	W	5 1/4				S			Yes				
6254	220.00	100	90	4	50-22 ±3	W	5 1/4	2		Yes	S			Yes				
AR	GCS100	260.00	100	93	4	33-30		6 x 9	3		Yes	F, S	3 3/4	Yes	No			
	GCS200	200.00	100	88	4	38-32		5 1/4	2			F	2 1/8	Yes	No			
	GCS300	180.00	100	93	4	30-30		6 x 9	3	A		F	3 5/8	Yes	No			
	GCS400	145.00	90	92	4	58-30		6 1/2	2			F	2	Yes	No			
	GCS500	125.00	60	92	4	42-30		5 1/4	2			F	2 1/8	Yes	No			
	GCS600	70.00	35	92	4	75-25		4	W			F	1 3/4	Yes	No			
	GCS1200	47.50	35	91	4	63-20		4 x 6	W			F	2	Yes	No			
GCS1400	37.50	20	88	4	120-12		3 1/2	W			F	2	Yes	No				
ARI SYSTEMS	PA 414	99.00	200	90	4	80-18		4 1/4		A	No	S		Yes	Yes			
	PA 514	99.00	200	91	4	40-18		5 1/4		A	No	S		Yes	Yes			
	PA 534	189.00	400	94	4	32-18		5 1/4		A	No	S		Yes	Yes			
	PA 934	219.00	400	97	4	32-18		6 x 9		A	No	S		Yes	Yes			

SPEAKERS

MANUFACTURER	Model	Price \$ (If Sold Individually)	Price \$ (If Sold in Pairs)	Recommended Maximum Power, Watts	Sensitivity, dB SPL (1 Watt/1 Meter)	Impedance, Ohms	Frequency Response, Hz to kHz, ± dB	DRIVERS										Notes
								Subwoofer Only (S) Midrange Only (M), Two-Way Only (W) Woofer Size, Inches	Woofer (W), 2-Way (2), 3-Way (3), 4-Way (4)	Applied Tweeters = A, Portable Tweeters = P	Separately Mounted Drivers?	Flush Mount (F), Surface Mount (S), Cornerable (C), Pole (P)	Maximum Required Mounting Depth, inches	Weatherproof?	Application Guide Available?			
AUDIOMOBILE	RSH-4.5	220.00	50	92	4	200-20 ± 3			2	P	No	S		Yes		Satellite.		
	RSV-4.5	220.00	50	92	4	200-20 ± 3			2	P	No	S		Yes		As above.		
	FS-3.5	140.00	25	89	4	200-20 ± 3			2	P	No	S		Yes		As above.		
	FS-4x6	140.00	25	89	4	200-20 ± 3			2	P	No	S		Yes				
	SW-69	220.00	75	89	2	20-200 Hz	S	6 x 9 (2)6x9				F	4 6	Yes		Subwoofer box, 7½ x 8½ x 27 inches.		
	SWB-27	135.00	100	89	2	20-200 Hz	S					F		Yes		Subwoofer box, 6 x 8½ x 32 inches.		
	SWB-32	255.00	100	89	2	20-200 Hz	S	(4)5¼			S		Yes		Subwoofer box, 6 x 6 x 41 inches.			
	SWB-41	255.00	100	89	2	20-200 Hz	S	(4)5¼			S		Yes					
AUDIOPRO	B2-07	499.95	30 Inc.	105		40-250 Hz	S	4					8	No		Selectable preamp/speaker input level.		
	C-101		10	90		50-20 ± 3		4	2	P	F	1¼	Yes	Yes				
	C-132		50	92		45-20 ± 3		5¼	2	P	F	1¼	Yes	Yes				
	C-165		100	93		45-20 ± 3		6½	2	P	F	2¼	Yes	Yes				
	C-916		100	93		45-20 ± 3		3¼x6	2	P	F	1¼	Yes	Yes				
AUDIOSOURCE	LS-One	179.95	40	83	8	100-20 ± 3		4	2	P	No	S		No	No			
	LS-Four	149.95	50	87	4	100-20 ± 3		4	2	No	No	F	1¼	No	No			
	SW-Two	99.95	80	87	7	45-5 ± 3	S	6½				F	3	No	No			
	Source-Four System	249.95															Includes two Model LS-Four and two Model SW-Two speakers.	
AUDIOVOX	Tryvox-100	120.00	100		4/8	40-20		6 x 9	3		No	F		No	Yes			
	Tryvox-25	81.00	40		4/8	70-18		5¼	3		No	F		No	Yes			
	Tryvox-20	81.00	40		4/8	60-18		6 x 9	3		No	F		No	Yes			
	Tryvox-9	45.00	30		4/8	70-18		6 x 9	3		No	F		No	Yes			
	Tryvox-15	30.00	30		4/8	80-18		5¼	3		No	F		No	Yes			
	CX120	60.00	100		4/8	70-18		6 x 9	2		No	F		Yes	Yes			
	CX20	55.00	100		4/8	90-18		5¼	2		No	F		Yes	Yes			
	CX41	60.00	30		4/8	80-18		4 x 10	2		No	F		Yes	Yes			
	CX105	42.00	30		4/8	80-18		6 x 9	2		No	F		No	Yes			
	CX46	45.00	20		4/8	100-18		4 x 6	2		No	F		No	Yes			
	CX10	45.00	30		4/8	90-18		5¼	2		No	F		No	Yes			
	CX6	46.00	30		4/8	100-20		5	2		No	F		No	Yes			
	CX4	35.00	30		4/8	120-17		4	2		No	F		No	Yes			
	CX3	35.00	20		4/8	120-16		5	2		No	F		No	Yes			
	CX2	34.00	25		4/8	110-17		5	2		No	F		No	Yes			
	SC1	20.00	15		4/8	120-15		5	W		No	F		No	Yes			
	Comp 100	75.00	50		4/8	50-20		4	2		No	S		No	Yes			
	SW60	31.00	30		4/8	130-14		4			No	S		No	Yes			
	SW40	36.00	30		4/8	100-18		5	2		No	S		No	Yes			
	SW30	29.00	30		4/8	100-15		5	W		No	C		No	Yes			
SC10	32.00	20		4/8	90-15		5¼	W		No	C		No	Yes				
SC5	30.00	15		4/8	120-14		5			No	F		No	Yes				
SC4	30.00	20		4/8	120-16		4	W		No	F		No	Yes				
SC3	25.00	20		4/8	120-15		3½			No	F		No	Yes				
SC2	25.00	15		4/8	100-15		5¼			No	F		No	Yes				
SW15	28.00	30		4/8	120-14		4			No	C		No	Yes				
AUTOTEK	ATK-40SE	49.95	60	89	4	100-20		4			No	F	1½	Yes	No			
	ATK-40XE	59.95	60	89	4	70-20		4	2		F	1½	Yes	No				
	ATK-65TE	79.95	120	90	4	60-21		6	3		F	2½	Yes	No				
	ATK-69XE	79.95	120	90	4	50-22		6 x 9	2		No	P	3	Yes	No			
	ATK-69TE	99.95	150	90	4	50-22		6 x 9	3		No	P	3¼	Yes	No			
BABB AUDIO	414	110.00	40	89	4	100-18 ± 3		4		No	F	1¼	Yes	No				
	514	120.00	40	91	4	60-18 ± 3		5¼		P	F	1½	Yes	No				
	534	200.00	80	94	4	40-18 ± 3		5¼		P	F	2¾	Yes	No		8-ohm version, Model 538.		
	934	220.00	80	97	4	32-18 ± 3		6 x 9		No	F	3	Yes	No		8-ohm version, Model 938.		
	C14	300.00	80	93	4	60-18 ± 3		5¼		P	No	3¼	Yes	No				
BECKER ELECTRONICS	BHB-One	229.95	100	92	4	50-20 ± 6		(2) 8								Mounts behind seat in full-size pickups; carpet-covered.		
	BHB-Two	199.95	100	92	4	60-20 ± 6		(2) 6								For hatchbacks and pickups; carpet-covered.		
	BHB-Three	239.95	100	92	4	40-20 ± 6		8								For mini pickups; carpet-covered.		
	Wedge-One	199.95	100	92	4	50-20 ± 6		6								For vans, hatchbacks, and wagons.		
	Wedge-Two	299.95	125	92	4	50-20 ± 6		2 (8)								For Camaros and Firebirds from 1982 on; drop-in replacement.		
	CFB-One Powered		60 Inc.			40-2.5 ± 6		(2) 10										
	BHBS-One Powered		60 Inc.			50-20 ± 6		(2) 10										
	CFB-One	199.95	150	94	4	40-2.5 ± 3		(2) 10									As above.	
	BHBS-One	299.95	150	96	4	50-20 ± 6	S	(2) 10									Carpet-covered.	
	BHB-One Powered		60 Inc.			50-20 ± 6		(2) 8										
	BHB-Two Powered		60 Inc.			60-20 ± 6		(2) 6										
	Wedge-Two Powered		60 Inc.			50-20 ± 6		(2) 8										
30B	59.00	42	88	4	150-12 ± 6		3½				F	1½						
41B	139.00	70	90	6	100-20 ± 6				2		F							
42B	89.00	35	90.5	4	90-20 ± 6		4		2		F	1½						
52B	99.00	55	92.5	4	80-20 ± 6		5¼		2		F	2½						
62B	109.00	63	93	4	60-20 ± 6		6¼		2		F	1½						



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and disconnecting most portable players, giving you the greatest compact disc flexibility.

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SPEAKERS

MANUFACTURER	Model	Price, \$ (If Sold Individually)	Price, \$ (If Sold in Pairs)	Recommended Maximum Power, Watts	Sensitivity, dB SPL (1 Watt/1 Meter)	Impedance, Ohms	Frequency Response, Hz to kHz, ±dB	DRIVERS										Notes
								Subwoofer Only (S), Woofer Only (W), Midrange Only (M), Tweeter Only (T)	Woofer Size, inches	Whizzer (W) 2-Way (2), 3-Way (3), 4-Way (4)	Angled Tweeter(s) = A, Pointable Tweeter(s) = P	Separately Mounted Drivers?	Flush Mount (F), Splice Mount (S), Conceivable (C), Pin (P)	Maximum Required Mounting Depth, inches	Weatherproofed?	Application Guide Available?		
CERWIN-VEGA	CS-18A	199.95	150	98	4	30-20 ± 3		6 x 9	2		No	F	3	No		H.f. circuit breaker. As above. Dual voice-coil. As above. As above. As above.		
	CS-17	159.95	150	96	4	40-20 ± 4		6 x 9	2		No	F	1 5/8	No				
	CS-6.5		100	95	4	50-20 ± 4		6 1/2	2	A	No	F	2	No				
	MSW-6.5	99.95	100	95	4	50-2 ± 3	W	6 1/2			No	F	2	No				
	LE 6X9D	89.95	150	98	4	30-1 ± 3	S	6 x 9			No	F	4	No				
	LE 8D	94.95	150	96	4	30-800 Hz ± 2	S	8			No	F	3 1/2	No				
	LE 10D	99.95	150	97	4	30-800 Hz ± 2	S	10			No	F	4 1/2	No				
	LE 12D	109.95	250	98	4	20-500 Hz ± 2	S	12			No	F	5 1/2	No				
	LE 15D	179.95	250	101	4	20-400 Hz ± 2	S	15			No	F	6 1/4	No				
	LE 6X9S	89.95	150	98	4	30-1 ± 2	S	6 x 9			No	F	4	No				
	LE 8S	94.95	150	96	4	30-800 Hz ± 2	S	8			No	F	3 1/2	No				
	LE 10S	99.95	150	97	4	30-800 Hz ± 2	S	8			No	F	4 1/2	No				
	LE 12S	109.95	250	98	4	20-500 Hz ± 2	S	12			No	F	5 1/2	No				
	LE 15S	179.95	250	101	4	20-400 Hz ± 2	S	15			No	F	6 1/4	No				
LE 18S4	344.95	300	103	4	18-250 Hz ± 2	S	18			No	F	7 1/4	No					
LE 18S8	344.95	300	103	8	18-250 Hz ± 2	S	18			No	F	7 1/4	No					
CLARION	SE601	79.95	80	90	4	40-6	S	6 1/2			No	F	2 3/4	Yes	Yes			
	SE250	34.95	80	93	4	3k-22k	T				No	F	7/8	Yes	Yes			
	SE320	99.95	30	89	4	70-20		3	2		No	S		Yes	Yes			
	SE990	159.95	120	93	4	30-23		6 x 9	4	A	No	F	2 7/8	Yes	Yes			
	SE980	129.95	80	94	4	50-21		6 x 9	3		No	F	3 1/8	Yes	Yes			
	SE970	89.95	60	95	4	50-20		6 x 9	2		No	F	3 1/8	Yes	Yes			
	SE971	89.95	50	95	4	60-21		6 x 9	2		No	F	1 3/4	Yes	Yes			
	SE630	104.95	60	92	4	50-22		6 1/2	3		No	F	2 1/2	Yes	Yes			
	SE631	104.95	60	90	4	40-22		6 1/2	3	A	No	F	2 1/8	Yes	Yes			
	SE625	74.95	40	90	4	50-21		6 1/2	2		No	F	1 5/8	Yes	Yes			
	SE620	74.95	40	95	4	80-20		6 1/2	2	A	No	F	2 1/4	Yes	Yes			
	SE621	74.95	40	92	4	70-20		6 1/2	2		No	F	1 1/2	Yes	Yes			
	SE612	59.95	40	92	4	70-19		6 1/2	W		No	F	1 1/2	Yes	Yes			
	SE610	54.95	40	92	4	70-19		6 1/2	W		No	F	2 1/4	Yes	Yes			
	SE530	74.95	40	91	4	90-20		5	3		No	F	1 3/4	Yes	Yes			
	SE520	69.95	30	90	4	80-18		5	2		No	F	1 5/8	Yes	Yes			
	SE521	69.95	30	90	4	60-20		5	2	A	No	F	1 1/2	Yes	Yes			
	SE510	39.95	15	93	4	75-19		5	W		No	F	1 5/8	Yes	Yes			
	SE524	49.95	30	90	4	75-21		5	2		No	F	1 5/8	Yes	Yes			
	SE431	69.95	30	90	4	60-20		4	3	A	No	F	1 5/8	Yes	Yes			
	SE420	64.95	30	91	4	120-18		4	2		No	F	1 3/4	Yes	Yes			
	SE411	44.95	20	90	4	100-20		4	W		No	F	1 1/8	Yes	Yes			
	SE410	49.95	40	91	4	90-18		4	W		No	F	1 5/8	Yes	Yes			
	SE153	99.95	40	92	4	50-22		4 x 10	2	A	No	F	2 1/2	Yes	Yes			
	SE675	49.95	30	90	4	90-20		4 x 6	2		No	F	1 7/8	Yes	Yes			
	SE671	39.95	20	90	4	90-17		4 x 6	2		No	F	1 3/4	Yes	Yes			
	SE325	39.95	30	88	4	120-20		3 1/2	2		No	F	1 1/8	Yes	Yes			
	SE310	24.95	20	88	4	100-20		3 1/2	W		No	F	1 5/8	Yes	Yes			
CLEMENS	System 55	350.00	700.00	100	86	6	42-25		5 1/4			F	3	Yes	Yes	Biamp capable. As above. As above. As above. As above.		
	System 65	450.00	900.00	100	86	6	42-25		6 1/2			F	3 1/2	Yes	Yes			
	System 67	550.00	1110.00	100	86	7	42-25		6 1/2			F	3 1/2	Yes	Yes			
	System 87	600.00	1200.00	100	87	7	42-25		8			F	3 1/2	Yes	Yes			
	Little D	300.00	600.00	100	86	6	42-25		5 1/4			S		Yes	Yes			
CONCORD	CS-141	59.95	40	91	4	70-20 ± 3		4	2		No	F	1 1/4	Yes	No			
	CS-153	69.95	40	98	4	60-20 ± 3		5 1/4	2		No	F	1 5/8	Yes	No			
	CS-261	79.95	50	95	4	40-20 ± 3		6 1/2	2		No	F	2	No	No			
	CS-264	99.95	90	101	4	40-18 ± 3		6 x 9	2		No	F	3 1/4	No	No			
	CS-300	199.95	80	88	8	70-20 ± 3		6	2		No	F	2 1/4	No	No			
	CS-400	249.95	80	88	4	80-20 ± 3		5 1/4	2		Yes	F, S	1 3/4	No	No			
COUSTIC	HS-862	59.95	80	90	4	68-18 ± 5		6 1/2	2	A	No	F	3 1/8		Includes spacer. As above.			
	HS-892	79.95	60	93	4	50-19 ± 5		6 x 9	2	A	No	F	3 3/8					
	HT-620	129.95	60	89	4	60-20 ± 4		5 1/4	2		No	P	1 1/2	Yes				
	HT-621	169.95	60	89	4	60-20 ± 4		5 1/4	2	P	Yes	C	2	Yes				
	HT-640		100	91	4	32-600 Hz ± 3	S	8					4	Yes				
	HT-650	75.00	150	92	4	24-600 Hz ± 3	S	10					4 1/2	Yes				
	HS-893	99.95	80	94	4	48-20 ± 5		6 x 9	3	A		C	3 3/8					
	HS-890	64.95	80	92	4	58-18 ± 5		6 x 9	W			C	3 3/8					
	HS-863	74.95	60	91	4	75-19 ± 5		6 1/2	3	A		C	3 1/8					
	HS-860	42.95	60	90	4	87-15 ± 5		6 1/2	W			C	3 1/8					
	HS-842	39.95	40	88	4	106-18 ± 5		4	2	A		C	1 1/2					
	HS-840	31.95	40	88	4	106-18 ± 5		4	W			C	1 1/2					
	HS-830	16.95	25	86	4	180-15 ± 5		3 1/2				C	1 1/2					
CS-8822S	89.95	60	90	4	80-20 ± 5		4	2	P		S							
CS-8866S	109.95	100	90	4	80-20 ± 5		4	2	P		S							

M

A



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LM50



LX30/LX40



LXT10/LT30



LT40

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S

SPEAKERS

MANUFACTURER	Model	Price, \$ (If Sold Individually)	Price, \$ (If Sold in Pairs)	Recommended Maximum Power, Watts	Sensitivity, dB SPL (1 Watt/1 Meter)	Impedance, Ohms	Frequency Response, Hz to kHz, ±dB	DRIVERS										Notes
								Subwoofer Only (S) Midrange Only (M), Tweeter Only (T)	Woofer Size, Inches	Woofer (W), 2-Way (2) 3-Way (3), 4-Way (4)	Applied Tweeters = A, Removable Tweeters = P	Separately Mounted Drivers?	Flux Mount (F), Surface Mount (S), Convertible (C), Plate (P)	Maximum Required Mounting Depth, Inches	Weatherproofed?	Application Guide Available?		
FULTRON (Continued)	15-9306	40.00	60	94	4	50-20		5 1/4	3				F	1 3/8	No	Yes	As above. As above but two positions.	
	15-9305	30.00	50	92	4	60-20		4	3			F	1 1/8	No	Yes			
	15-9270	90.00	50		4	50-20		4	3			S		No	Yes			
	15-9250	50.00	35		4	60-20		3	2			S		No	Yes			
	15-9240	25.00	15		4	90-14		5				C	5/8	No	Yes			
	15-9069	30.00	30		4	40-20		6 x 9	W				F	3/8	No	Yes		
15-9006	25.00	25		4	65-18		5 1/4	W				F	2	No	Yes			
GOLD SOUND	GS110C	36.00	60	91	6	3k-21k ±3	T						F	1	Yes	Dual voice-coils. As above. As above. Includes cabinet enclosure. As above. As above. As above.		
	GS410	48.00	60	90	4	90-8 ±3	M						F	2	Yes			
	GS510	48.00	60	90	4	80-6 ±3	M						F	2	Yes			
	GS612	48.00	60	91	4/8	45-6	W	6 1/2					F	3 1/2	Yes			
	GS620	66.00	100	92	4/8	40-2 ±3	W	6 1/2					F	3 1/2	Yes			
	GS69A	78.00	100	93	4	40-2 ±3	S	6 x 9					F	3 1/2	Yes			
	GS820	78.00	100	91	4/8	32-2 ±3	S	8					F	4	Yes			
	GS1040	98.00	150	93	4/8	22-2 ±3	S	10					F	4	Yes			
	GS1260	138.00	200	94	4/8	20-1 ±3	S	12					F	4	Yes			
	GS4C	69.00	60	91	4	65-20		4	2	P	No		F	2	Yes			
	GS4x6C	79.00	60	92	4	58-20		4 x 6	2	P	No		F	2 1/2	Yes			
	GS4x10C	89.00	60	92	4	48-20		4 x 10	2	P	No		F	2 3/4	Yes			
	GS5C	79.00	60	90	4	80-20		5 1/4	2	P	No		F	2	Yes			
	GS5x7C	89.00	60	92	4	58-20		5 x 7	2	P	No		F	2 1/2	Yes			
	GS6C	89.00	60		4			6 1/2	2	P	No		F	3	Yes			
	GS69C	89.00	60		4			6 x 9	2	P	No		F	3 1/2	Yes			
	GS69AC	129.00	100		4			6 x 9	2	P	No		F	3 1/2	Yes			
	GS8AC	138.00	100		4			8	2	P	No		F	4	Yes			
	Roaring 10	128.00	250	96	4	30-2	S	10					F	4	Yes			
	Roaring 12	138.00	250	97	4	28-2	S	12					F	4 1/4	Yes			
Roaring 15	148.00	300	98	4	25-2	S	15					F	5 1/2	Yes				
Roaring 1596	198.00	500	104	4	20-2	S	15					F	5 1/8	Yes				
GS6/4 Rolling Thunder	239.00	200	92	2/4	45-2 ±3	S	(4) 6					F	7	Yes				
GS8/2 Rolling Thunder	269.00	200	91	4	32-2 ±3	S	(2) 8					F	8	Yes				
GS10/2 Rolling Thunder	299.00	300	94	4	22-1 ±3	S	(2) 10					F	8	Yes				
GS12/2 Rolling Thunder	499.00	400	96	4	20-500 Hz ±3	S	(2) 12					F	10	Yes				
GS15/2 Rolling Thunder	699.00	1k	104	4	20-400 Hz ±3	S	(2) 15					F	15	Yes				
HARMS LABS	ZP	199.95	80	90	8	60-22 ±4		10		A	Yes	S		Yes	No	Single-cabinet stereo. As above. As above. As above. As above.		
	ZD	299.95	80	90	8	60-20 ±3		10		A	Yes	S		Yes	No			
	Big P	249.95	80	93	8	30-22 ±4		10		A	Yes	S		Yes	No			
	Big D	349.95	80	93	8	30-20 ±3		10		A	Yes	S		Yes	No			
	Pickup Box	249.95	80	93	8	45-22		10			Yes	S		Yes	No			
HI-COMP	HS-16	45.00	20		4/8	90-18		4	W		No	F	1 3/4	Yes	No			
	HS-21	50.00	20		4/8	90-20		4 x 6	2		No	F	1 3/4	Yes	No			
	HS-30	35.00	20		4/8	90-18		3 1/2	W		No	F		Yes	No			
	HS-41	60.00	25		4/8	90-20		4	2		No	F	1 3/4	Yes	No			
	HS-51	80.00	40		4/8	70-20		5 1/4	2		No	F	2	Yes	No			
	HS-56	50.00	30		4/8	100-18		5	W		Yes	F	1 1/2	Yes	No			
	HS-70	120.00	100		4/8	60-20		6 x 9	2		No	F		Yes	No			
	HS-75	80.00	30		4/8	60-20		4 x 10	2		No	F		Yes	No			
	HS-80	140.00	100		4/8	60-20		6 x 9	3		No	F		Yes	No			
	HS-100	180.00	100		4/8	50-20		6 x 9	3		No	F		Yes	No			
HITACHI	SF123	37.95	25	89	4	80-18	W	5				F	1 1/8	Yes	No			
	SF124	59.95	25	89	4	80-20		5	2	P	Yes	F	1 1/8	Yes	No			
	SF4010	199.95	80	91	4	70-20		4 x 10	3	P	Yes	F	2 1/2	No	No			
	SF6090	234.95	120	92	4	70-20		6 x 9	3	P	Yes	F	3	No	No			
	SF165	139.95	30	92	4	70-20		6 3/8	3	A	Yes	F	1 3/4	No	No			
	SX103	169.95	30	88	4	70-20		4	2	P	Yes	S		No	No			
INFINITY	CS-1 Series II	325.00	125	87	4	36-32 ±3		6 x 9	3	P	Yes	C	3	Yes	No	Blamp or triamp capable; EMIT tweeter. EMIT tweeter. As above. Drop-in replacement. As above. Includes crossover; tweeter protection.		
	A693 Series II	215.00	80	90	4	40-32 ±3		6 x 9	3		No	C	3	Yes	No			
	A692 Series II	155.00	80	90	4	40-22 ±3		6 x 9	2		No	C	3	Yes	No			
	A63 Series II	165.00	60	88	4	60-32 ±3		6 1/2	3		No	C		Yes	No			
	A62 Series II	120.00	60	88	4	60-22 ±3		6 1/2	2		No	S		Yes	No			
	A52 Series II	115.00	40	88	4	65-22 ±3		5 1/4	2			S		Yes	No			
	A42 Series II	85.00	30	87	4	95-16 ±3		4	W			S		Yes	No			
	A462 Series II	50.00	25	86	4	95-16 ±3		4 x 6	W			S		Yes	No			
	A32 Series II	40.00	20	86	4	110-16 ±3		3 1/2	W			S		Yes	No			
	EMIT	99.00	40	89	4	4k-32k ±3	T				P		S		Yes		No	
JAMO	30	55.95	50	87	4	70-14		4					1 3/4	Yes	Yes	Blamped.		
	40	69.95	60	88	4	70-20		4					1 3/4	Yes	Yes			
	50	84.95	70	89	4	60-20		5					1 3/4	Yes	Yes			
	45	99.95	75	88	4	70-20		4					1 3/8	Yes	Yes			
	60	179.95	85	89	4	70-20		4					1 3/8	Yes	Yes			
	70	109.95	95	91	4	50-20		6 1/2	2				1 1/4	Yes	Yes			
	90	179.95	130	94	4	40-20		6 x 9	3				3	Yes	Yes			
	305	219.95	10,			50-20		5					3	Yes	Yes			
			20										1 3/4	Yes	Yes			
			Inc.		10k													

SPEAKERS

MANUFACTURER	Model	Price, \$				Recommended Maximum Power, Watts	Sensitivity, db SPL (1 Watt/1 Meter)	Impedance, Ohms	Frequency Response, Hz to kHz, ±dB	DRIVERS										Notes
		(If Sold Individually)	(If Sold in Pairs)							Subwoofer Only (S)	Woofer Only (W)	Midrange Only (M)	Tweeter Only (T)	Woofer Size, Inches	Whizzer (W) 2-Way (2)	3-Way (3)	4-Way (4)	Angular Tweeter(s) = A	Possible Tweeter(s) = P	
MAGNADYME	SF5DT	13.95	29.95	60	92.5	4	1k-22k	T								C	3/4	No	No	
	SF550	15.95	32.95	50	91	8	500-8	M								F	2	Yes	No	
	S650	24.95	52.95	60	92	8	80-3	W	6							F	2 1/2	Yes	No	
	ASF692B	19.95	39.95	35	96	4	50-5	W	6 x 9							F	3	Yes	No	
	ASF695B	29.95	59.95	60	93	4	50-2	W	6 x 9							F	3 1/2	Yes	No	
	LS80P	39.95	79.95	60	94	4	40-5	W	8							F	3	Yes	No	
	LS60PL		79.95	60	92	4	45-25		6	2						P	2	Yes	No	
	LS50PL		66.95	50	90	4	55-25		5	2						P	1 1/2	Yes	No	
	SF46X		29.95	25	89	4	80-18		4 x 6	2						P	1 1/2	Yes	No	
	SF580X		29.95	25	89	4	70-20		4	2						F	1 1/2	Yes	No	
	SF505T		29.95	25	90	4	80-20		5	3						F	1 1/4	Yes	No	
	SF64T		35.95	40	91	4	70-20		6	3						F	1 1/2	Yes	No	
	SF65D		69.95	100	93	4	50-20		6	2						F	2 3/4	Yes	No	Fits 5 1/4-inch hole.
	SF96DT		99.95	100	92	4	35-25		6 x 9	3						F	3 1/2	Yes	No	
	S520		49.95	30	89	4	65-20		3 1/2	3						S		Yes	No	
	MAGNUM	4506		99.95	30	84	4	70-13 ±3	M							F	1 3/4	Yes		
4512D			129.95	30	85	4	85-20 ±3		4 1/2	2					F	1 7/8	Yes			
5312D			149.95	40	85	4	85-20 ±3		5 1/4	2			No		F	2 1/4	Yes			
4112D			169.95	50	87	4	60-20 ±3		4 x 10	2			No		F	2 3/4	Yes			
6912D			169.95	60	89	4	45-20 ±3		6 x 9	2			No		F	2 7/8	Yes			
6932D			219.95	100	91	4	52-20 ±3		6 x 9	2			No		F	2 7/8	Yes			
8032D			249.95	125	88	4	45-20 ±3		8	2			No		F	3 1/4	Yes			
8030W			189.95	110	90	4	40-4.5 ±3	S	8				No		F	3 1/4	Yes		Fits 6 x 9-inch hole. As above.	
6930W			169.95	100	90	4	40-4.5 ±3	S	6 x 9				No		F	3 1/4	Yes			
MAGTONE	W-8040		149.95	140	94	4	50-900 Hz	W	8						C	3 3/8	No	Yes		
	W-5040		89.95	100	92	4	100-15	M							C	2 1/2	No	Yes		
	W-3246		49.95	60	90	4	2.7k-20k	T							C	3/4	No	Yes		
	W-6913TN		99.95	120	95	4	50-20		6 x 9	3	P				C	2 7/8	No	Yes		
	W-6513TN		89.95	100	94	4	70-20		6 1/2	3	P				C	2 1/2	No	Yes		
MAJESTIC	MPS 42SL		59.95	60		4	60-20		4	2		No		F	1 1/2	Yes				
	MPS 52SL		59.95	60		4	60-20		5 1/4	2		No		F	1 3/4	Yes				
	MPS 66		69.95	120		4	50-20		6	2		No		F	2 1/2	Yes				
	MCS 8		79.95	150	91	4	50-5	W	8			No		F	3 1/2	Yes				
	MCS 3		39.95	150	90	4	3k-20k	T							F	3/4	Yes			
MANSOCR	SK350T			75	91	4	4.5k-20k ±3	T				A			F	1				
	DS4002		60	91	4	90-20 ±3		4	2		A			F	1 7/8					
	DS6003		120	90	4	60-21 ±3		6	3		A			F	2 5/8					
	DS6903		150	92	4	50-21 ±3		6 x 9	3		A			F	3 7/8					
	SK325F	29.95	40	88	4	80-16 ±3		3 1/2	W					F	1 1/2					
	SK426F	44.95	20	90	4	65-20 ±3		4 x 6	2					F	1 3/4					
	SK405F	34.95	20	91.5	4	50-18 ±3		4	W					F	1 1/2					
	SK420F	59.95	40	90	4	70-20 ±3		4	2					F	1 1/2					
	SK525F	54.95	20	90	4	50-18 ±3		5	W					F	2					
	SK605F	29.95	20	90	4	50-16 ±3		6	W					F	2 1/8					
	SK620F	39.95	30	90	4	55-18 ±3		6	2					F	2 1/8					
	SK655F	69.95	50	91	4	70-20 ±3		6	2					F	1 1/2	Yes				
	SK665F	79.95	60	92	4	70-21 ±3		6	3					F	1 1/2	Yes				
	SK412F	49.95																		
	SK527F	49.95	20	90	4	50-18 ±3		5 x 7	2					F	1					
	SK693F	59.95	30	90	4	40-16 ±3		6 x 9	3					F	3 1/2					
	SK696F	129.95	100	91	4	40-20 ±3		6 x 9	3					F	4 3/8					
	SK697F	119.95	100	98	4	30-5 ±3		8						P	1 7/8					
SK698F	149.95	100	92	4	30-22 ±3	S	8	3					P	1 7/8						
SK333S	99.95	40	87.5	4	60-20 ±3		3	2					S							
MARANTZ	SP140		39.95	20		4	110-15		4	W				F	1 5/8					
	SP150		49.95	25		4	100-17		5 1/4	2				F	1 3/4					
	SP160		69.95	40		4	70-20		6 1/2	2				F	1 1/2					
	SP200		119.95	100		4	50-20		6 x 9	3				F	4 3/8					
MITSUBISHI	SG-69TM		100.00	100		4	50-20 ±3		6 x 9	3		No		C	3 3/8	No	Yes			
	SG-16CM		80.00	30		4	100-18 ±3		6 1/2	2		No		S		No	Yes			
	SG-12CM		70.00	30		4	130-18 ±3		5	2		No		S		No	Yes			
	SG-10CB		70.00	60		4	100-20 ±3		4	2		No		S		No	Yes			
	SG-10CM		50.00	25		4	150-15 ±3		4	2		No		S		No	Yes			
	SG-10WM		40.00	25		4	150-14 ±3		4	W		No		S		No	Yes			
	SG-46CB		40.00	25		4	90-18 ±3		4 x 6	2		No		C	1 7/8	No	Yes			
MOREL ACOUSTICS	Integra-1II		175.00	100	92	4	45-25 ±3		6	2		No		F	2 1/2	Yes	No	Blamp capable, dual voice-coils. As above.		
	Integra-2II		199.00	120	93	4	35-25 ±3	T	8	2		No		F	2 7/8	Yes	No			
	MDT-101		95.00	100	92	6	1.2k-2.5k ±3							F	1 1/2	Yes	No			
	CDM-75		175.00	100	93	4	300-5 ±3	M						F	2 1/2	Yes	No			
	MCW-160		125.00	150	91	4	45-5 ±3	W	6					S		Yes	No			
	MCW-220		135.00	150	92	4	35-4.5 ±3	W	8					S	2 1/8	Yes	No	Cabinet enclosure.		
	CR-7		395.00	125	89	4	70-25 ±3		6	2	A	Yes		S		Yes	No			
	CR-8		339.00	125	90	4	60-25 ±3		6	2	A	Yes		S		Yes	No			
	CR-3		328.00	100	92	4	300-25 ±3		8 1/2	2	A	Yes		P	1 1/8	Yes	No	Dual voice-coils.		
	Push Pull	199.00	150	92	4	30-250 Hz ±3	S							F	2 1/2	Yes	No			

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SPEAKERS

MANUFACTURER	Model	Price, \$ (If Sold Individually)	Price, \$ (If Sold in Pairs)	Recommended Maximum Power, Watts	Sensitivity, dB SPL (1 Watt/1 Meter)	Impedance, Ohms	Frequency Response, Hz to kHz, ±dB	DRIVERS										Weatherproofed?	Application Guide Available?	Notes
								Subwoofer Only (S) Midrange Only (M) Tweeter Only (T)	Woofer Size, inches	Woofer (W) 3-Way (3) 2-Way (2) 4-Way (4)	Angled Tweeter (A) Pivotal Tweeter (P)	Separately Mounted Drivers?	Flush Mount (F) Convertible (C) Pile (P)	Maximum Required Mounting Depth, inches						
MTX	4.5	119.50	30	92	4	90-20 ±3		4 1/2	2		No	F	1 3/4	Yes		Carpet-covered; fits behind seat of mini pickups. Carpet-covered; fits behind seat of full-size pickups. Carpet-covered; for hatchbacks. Carpet-covered.				
	5.3	129.50	30	94	4	75-20 ±3		5 1/4	2		No	F	1 7/8	Yes						
	6.5	139.50	30	91	4	60-20 ±3		6 1/2	2		No	F	2 1/2	Yes						
	6.9	139.50	30	93	4	55-20 ±3		6 x 9	2		No	F	3	Yes						
	35SB	299.00	100	94	4	60-2.2 ±3		8	2		No	S								
	45SB	399.00	150	97	4	55-2.2 ±3		10	3	A	No	S								
MTX	55HB	200.00	75	91.5	4	40-2.2 ±3	S	12	3	A	No	S								
	Mini-sub	139.95	30	97	4	65-3 ±3		5 1/4	2		No	S								
	MP46C					200-2 ±3					No	P		Yes	Yes					
NAKAMICHI	SP-400	359.00	80	85	4	50-22		5 1/4	3		No	P	1 1/4	No	No	Selectable crossover points.				
	SP-300	319.00	80	86	4	50-22		5 1/4	2	A/P	No	P	1 3/8	No	No					
	SP-200	219.00	80	86	4	50-20		5 1/4	2		No	P	1 3/8	Yes	No					
	SP-80	199.00	160	92	4	30-1	S	8			No	F	3 3/8	Yes	No					
	SP-50	125.00	80	87	4	50-6	W	5 1/4			No	F	1 1/2	Yes	No					
	SP-10	160.00	40	86	4	2.5k-22k	T				No	F		Yes	No					
PANASONIC	EAB-0651	79.95	80	92	4	35-22		6 1/2	2	A	No	F			Yes					
	EAB-S41	39.95	40	91		50-22		4	W		No	F		Yes						
	EAB-S45	44.95	40	92		50-22		4	2	A	No	F		Yes						
	EAB-S61	44.95	50	92		40-22		6 1/2	W		No	F		Yes						
	EAB-S65	59.95	60	92		40-22		6 1/2	2	A	No	F		Yes						
	EAB-466	49.95	50	90	4	60-22		4 x 6	2		No	F		Yes						
	EAB-0551	59.95	40	92		45-22		5 1/4	2	A	No	F		Yes						
	EAB-431	49.95	40	92		50-20		4	2		No	F		Yes						
	EAB-0451	64.95	60	92		50-22		4	2	A	No	F		Yes						
	EAB-0641	59.95	60	92		40-20		6 1/2	2		No	F		Yes						
	EAB-4151	79.95	60	92	4	45-22		4 x 10	2		No	F	3 3/8	Yes						
	EAB-D670	129.95	120	92	4	35-22		6 1/2	3	A	No	F	2 5/8	Yes						
	EAB-D671	119.95	100	92	4	35-22		6 1/2	3	A	No	F	2 5/8	Yes						
	EAB-D970	149.95	150	93	4	30-22		6 x 9	3	A	No	F	4 1/8	Yes						
	EAB-0450	99.95	100	92	4	50-22		4	2	A	No	F	2 1/8	Yes						
	EAB-S69	69.95	80	92	4	40-22		6 x 9	2		No	F		Yes						
	EAB-697	119.95	100	94	4	30-22		6 x 9	3	A	No	F		Yes						
	EAB-695	89.95	80	94.5	4	30-22		6 x 9	2	A	No	F		Yes						
	EAB-T65	79.95	30	92	4	40-22		6 1/2	2		No	F		Yes						
	EAB-T60	59.95	30	91	4	40-22		6 1/2	2		No	F		Yes						
EAB-T50	49.95	25	89	4	50-16		5	W		No	F		Yes							
EAB-030	29.95	30	90	4	100-20		3 1/2	W		No	F		Yes							
PARASOUND	SW80	169.95	100	88	4	35-600 Hz ±4	S	8				F	4	No	No	Fits 6 x 9-inch hole.				
	CMs250	149.95	80	90	4	65-22 ±4		4	2		P	1 1/2	Yes	No						
	CMs330	199.95	80	89	4	60-22 ±4		4	2		S			No						
	CRs220	99.95	60	92	4	80-20 ±4		4	2		S			No						
	STM96	129.95	100	94	4	60-22 ±4		9	3		F	3		No						
	SCX60	89.95	80	91	4	63-22 ±4		6	2	No	F	1 1/2		No						
	SCX50	79.95	60	90	4	70-22 ±4		5 1/4	2	No	F	1 1/2		No						
SX40	44.95	40	88	4	80-19 ±4		4	W		No	F	1 1/2		No						
PECONIC	1369	59.95	50	4	4	50-20		6 x 9	3		No	F								
	1355	46.95	50	4	4	50-20		5 1/4	3		No	F								
	1150	29.95	20	4	4	50-20		5 1/4	W		No	F	1 1/8							
PHASE LINEAR	PL 3690	200.00	250	92	4	36-27		6 x 9	3		No	F	3	Yes	Biamp capable. As above.					
	PL 2650	130.00	160	90	4	55-27		6 1/2	2		No	F	1 7/8	Yes						
	PL 2450	85.00	100	89	4	60-27		4 1/2	2		No	F	1 3/4	Yes						
	PL 1400	65.00	75	88	4	65-22		4	W		No	F	1 3/8	Yes						
PHILIPS	510	249.95	200	92	4	35-22		6 1/2	3		No			Yes						
	520	279.95	200	92	4	35-22		6 1/2	3		No			Yes						
	PRO 8869	199.95	200	92	4	40-22		6 x 9	3		F	3 1/4		Yes						
	PRO 8769	149.95	200	92	4	40-20		6 x 9	2		No	F	3 1/4	Yes						
	PRO 8749	129.95	100	93	4	50-20		6 x 9	2		No	F	3 1/4	Yes						
	EN 8810	139.95	100	93	4	50-20		6 x 9	2		No	F	3	Yes						
	PRO 635	149.95	110	93	4	25-22		6 1/2	3		No	F	2 1/8	Yes						
	PRO 620	129.95	110	94	4	30-22		6 1/2	2		No	F	2 1/8	Yes						
	PRO 610	99.95	60	95	4	30-22		6 1/2	W		No	F	2 1/8	Yes						
	SFL 621	79.95	30	92	4	35-22		6 1/2	2		No	F	1 1/2	Yes						
	PRO 510	89.95	60	93	4	35-20		5 1/4	W		No	F	1 3/4	Yes						
	PRO 520	119.95	80	93	4	35-21		5 1/4	2		No	F	1 3/4	Yes						
	PRO 535	139.95	80	93	4	35-22		5 1/4	3		No	F	1 3/4	Yes						
	PRO 8890	99.95	60	91	4	80-22		4	2		No	F	1	Yes						
	PRO 420	99.95	80	91	4	40-21		4	2		No	F	1 1/2	Yes						
	PRO 410	69.95	80	91	4	45-20		4	W		No	F	1 1/2	Yes						
	EN 8846	89.95	60	90	4	100-22		3 1/2	2		No	F	1 1/2	Yes						
	EN 8343	49.95	100	90	4	2.7k-22k	T				F	3/4		Yes						
	EN 8340	49.95	100	90	4	2.7k-22k	T				F	3/4		Yes						
	EN 8335	49.95	100	90	4	2.7k-22k	T				F	3/4		Yes						
	PRO 6500	119.95	150	94	4	60-4	S	6 1/2			F	2 3/4		Yes						
	PRO 6900	139.95	200	94	4	48-4	S	6 x 9			F	3 1/4		Yes						
	PRO 8000	149.95	200	94	4	43-3	S	8			F	3 5/8		Yes						
	PRO 600	109.95	150	94	4	30-14	S	6 1/2			F	2 3/8		Yes						
	PRO 800	139.95	200	94	4	30-14	S	8			F	3 1/2		Yes						

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SPEAKERS

MANUFACTURER	Model	Price, \$ (If Sold Individually)	Price, \$ (If Sold in Pairs)	Recommended Maximum Power, Watts	Sensitivity, dB SPL (1 Watt/1 Meter)	Impedance, Ohms	Frequency Response, Hz to KHz, ±dB	DRIVERS										Notes
								Subwoofer Only (S) Midrange Only (M), Tweeter Only (T)	Woofer Size, Inches	Woofer Dia. (W) 3-Way (3), 4-Way (4)	Agreed Tweeters = A, Variable Tweeters = P	Separately Mounted Drivers?	Flush Mount (F), Convertible (C), Plate (P)	Maximum Required Mounting Depth, Inches	Weatherproofed?	Application Guide Available?		
PIONEER	TS-V10	149.95	60	90	4	48-25		4	2		No	F	17/8	Yes	Yes			
	TS-1080	69.95	30	91	4	50-21		4	2		No	F	13/4	Yes	Yes			
	TS-1012	49.95	30	91	4	50-20		4	2		No	F	13/4	No	Yes			
	TS-1030	44.95	30	91.5	4	50-20		4	2		No	F	13/4	No	Yes			
	TS-1020K	44.95	30	90	4	50-17		4	2		No	F	13/4	No	Yes			
	TS-X30	164.95	100	88	4	50-20		4x4 3/4	3		No	S		No	Yes			
	TS-X20	99.95	60	88	4	70-20		4 x 4	3		No	S		No	Yes			
	TS-X4	79.95	60	89	4	90-20		4	2		No	S		No	Yes			
	TS-55	39.95	40	90	4	180-13		5 1/8			No	S		No	Yes			
	TS-33	29.95	30	88	4	180-20		2 3/8			No	S		No	Yes			
	TS-1020	44.95	30	90	4	50-17		4	2		No	F	13/4	No	Yes			
	TS-1011	34.95	30	90	4	50-16		4	2		No	F	13/4	Yes	Yes			
	TS-V16	229.95	150	91	4	30-25		6 1/2	3		No	F	2 3/8	Yes	Yes			
	TS-1685	129.95	150	90	4	30-20		6 1/2	3		No	F	2 1/2	Yes	Yes			
	TS-1675	99.95	100	90	4	30-20		6 1/2	3		No	F	2 1/8	Yes	Yes			
	TS-1665	79.95	60	92	4	30-20		6 1/2	3		No	F	1 7/8		Yes			
	TS-1625	69.95	100	92	4	30-20		6 1/2	2		No	F	1 3/8	Yes	Yes			
	TS-1612	54.95	30	91.5	4	40-20		6 1/2	2		No	F	1 7/8	No	Yes			
	TS-1611	39.95	30	92	4	40-20		6 1/2	2		No	F	2	No	Yes			
	TS-S9	74.95	100	89	4	4k-22k	T				No	C	3/4	No	Yes			
	TS-M4	44.95	30	91.5	4	400-20	T				No	S		No	Yes			
	TS-T5	59.95	100	92	4	200-20	T				No	F	1 3/8	No	Yes			
	TS-4105	109.95	100	93	4	38-20		4 x 10	3		No	F	2 1/2	No	Yes			
	TS-4103	84.95	100	92	4	40-20		4 x 10	2		No	F	2 1/2	No	Yes			
	TS-468	54.95	30	89	4	50-20		4 x 6	2		No	F	1 3/4	No	Yes			
	TS-467	39.95	30	89	4	60-20		4 x 6	2		No	F	1 3/4	No	Yes			
	TS-875	49.95	30	88	4	90-20		3 1/2	2		No	F	1 1/2	No	Yes			
	TS-873	29.95	30	88	4	90-20		3 1/2	2		No	F	1 1/2	No	Yes			
	TS-V89	269.95	150	93	4	28-25		6 x 9	3		No	F	2 3/4	No	Yes			
	TS-6970	184.95	150	93	4	28-25		6 x 9	4		No	F	3 1/2	No	Yes			
	TS-6960	164.95	120	94	4	30-23		6 x 9	4		No	F	3 1/2	No	Yes			
	TS-6950	129.95	120	94	4	30-22		6 x 9	3		No	F	3 1/2	No	Yes			
TS-6940	94.95	100	94	4	35-22		6 x 9	2		No	F	3 1/2	No	Yes				
TS-6930	79.95	60	93	4	35-22		6 x 9	2		No	F	2 3/4	No	Yes				
TS-6920	54.95	60	93	4	40-20		6 x 9	2		No	F	2 3/4	No	Yes				
TS-207	179.95	150	94	4	30-22		8	3		No	F	2 3/8	No	Yes				
TS-W204	149.95	150	94	4	28-9		8	3		No	F	2 3/8	No	Yes				
GTS-X80	399.95	100 Inc.	89	4	50-150 Hz	W	6 1/2			No	S		No	Yes	Motional feedback; built-in 100-watt mono amp with controller.			
TS-X15	449.95	150	89	4	45-40		5 1/8	4		No	S		No	Yes				
TS-X40	269.95	100	89	4	47-25		4x5 1/2	4		No	S		No	Yes				
POLK	MMIa	39.95	50	94	4	80-15		4	W			F	1 1/2	Yes	No			
	MMIIa	62.50	100	90	4	40-20.5		5 1/4	2		Yes	F	2 1/4	Yes	No			
	MMIV	109.95	100	88	4	40-20.5		5 1/4	2			P	1 3/4	Yes	No			
	MMVa	109.95	100	90	4	38-20.5		6 1/2	2			F, P	2 1/2	Yes	No			
	MMVaHF	39.95				4k-20.5k	T					P		Yes	No			
	MMX	99.95	100	91	4	38-20.5		6 1/2	2			F	2 1/2	Yes	No			
	MMXII	99.95	100	91	4	38-20.5		6 1/2	2			F	2 1/2	Yes	No			
	MMXIV	59.95	100	90	4	↑	S	6 1/2				F	2 1/2	Yes	No	±38 Hz to crossover; for multi-way systems. Includes crossover.		
MMXIVC	69.95	100	90	4	38-2.5	W	6 1/2				F	2 1/2	Yes	No				
POLYDAX	EZ-302		250.00	40	86	4	50-20 ±3		4	2	A	Yes	S		No	No		
	HIF 13J	22.95	30	86	4/8	42-5 ±3		5 1/4				F	2 1/2	No	No			
	HIF 17JS	24.95	40	87	4/8	29-5 ±3		6 1/2				F	3 3/8	No	No			
	HIF 20RS37	34.95	60	88	4/8	25-3 ±3		8				F	3 3/8	No	No			
	CAR 9.15B2V/4		40.00	30	89	4	100-20 ±3		3 1/2	2		Yes	P	1 3/8	No	No	Fits 4 x 6-inch hole.	
	Siare 10BL		31.95	20	90	4	80-17 ±3		4	W		No	F	1 3/8	Yes	Yes		
	Siare 12CX		36.95	30	91	4	70-20 ±3		5	2		No	F	1 3/4	Yes	Yes		
	Siare 16BC		31.95	40	90	4	60-20 ±3		6 1/2	W		No	F	1 3/4	Yes	Yes		
	Siare 16CX		37.95	40	92	4	50-20 ±3		6 1/2	2		No	F	2	Yes	Yes		
	HD100D25	19.95	20	87	4/8	1k-20k ±3	T				P		S		No	No		
BASPCAV 2C FF TW60A	11.95	40	91	4/8	5k-20k ±3	T				P		C	5/8	Yes	No	Optional swivel mount for surface-mounting.		
PROTON	284		90.00	60	90	4	70-20 ±5		5 1/4	2	A	No	F	2 1/4	No	No		
	287		100.00	60	90	4	80-20 ±5		6 1/2	2	A	No	F	3	No	No		
	289		120.00	80	92	4	60-20 ±5		6 x 9	2		No	F	3	No	No		
	285		150.00	80	88	4	80-20 ±5		5 1/4	2	P	No	P	1 1/4	No	No		
	290		150.00	50	90	4	2k-20k ±5					No	P		No	No		
	295		70.00	80	88	4	80-6 ±5		5 1/4	W		No	S		No	No	Includes Model 280 crossover. System of Models 290, 280, and 295, \$220.00.	
PYLE	P100		359.95	150	91	4	35-20 ±3		(2)6 1/2, 8	2		Yes	S		Yes	Yes	Mounts behind seat in mini pickups.	
	P200	299.95		150	92	4	35-20 ±3		(2)6 1/2, 10	2		Yes	S		Yes	Yes	For hatchbacks, fastbacks, vans, and 4 x 4's.	
	P300	319.95		150	93	4	35-20 ±3		(2)6 1/2, 10	2		Yes	S		Yes	Yes	Mounts behind seat in pickup trucks.	
	K-HS100A		230.95	80	90	4	50-20 ±3		4	2			S		Yes	Yes		
	K-HS150P		235.95	80	90	4	50-20 ±3		4	2			S		Yes	Yes		
	K-HP523A		195.95	80	92	4	45-20 ±3		5 1/4	2			P	1 1/8	Yes	Yes		
	K-HP43A		159.95	80	91	4	200-20 ±3		4	2			P	3/4	Yes	Yes		
	P355W	24.95	59.95	40	89	4/8	90-18 ±3		3 1/2	W			F	1 1/2	Yes	Yes		
	355W	23.95	58.95	40	89	4/8	90-18 ±3		3 1/2	W			F	1 1/2	Yes	Yes		
	P499	26.95	77.95	50	91	4/8	70-18 ±3		4				F	1 3/4	Yes	Yes		
	499	25.95	76.95	50	91	4/8	70-18 ±3		4				F	1 3/4	Yes	Yes		
	P455R	45.95	119.95	50	91	4	60-20 ±3		4 1/2	2			F	1	Yes	Yes		
	4599	27.95	82.95	50	91	4/8	60-18 ±3		4 1/2				F	1 1/8	Yes	Yes		

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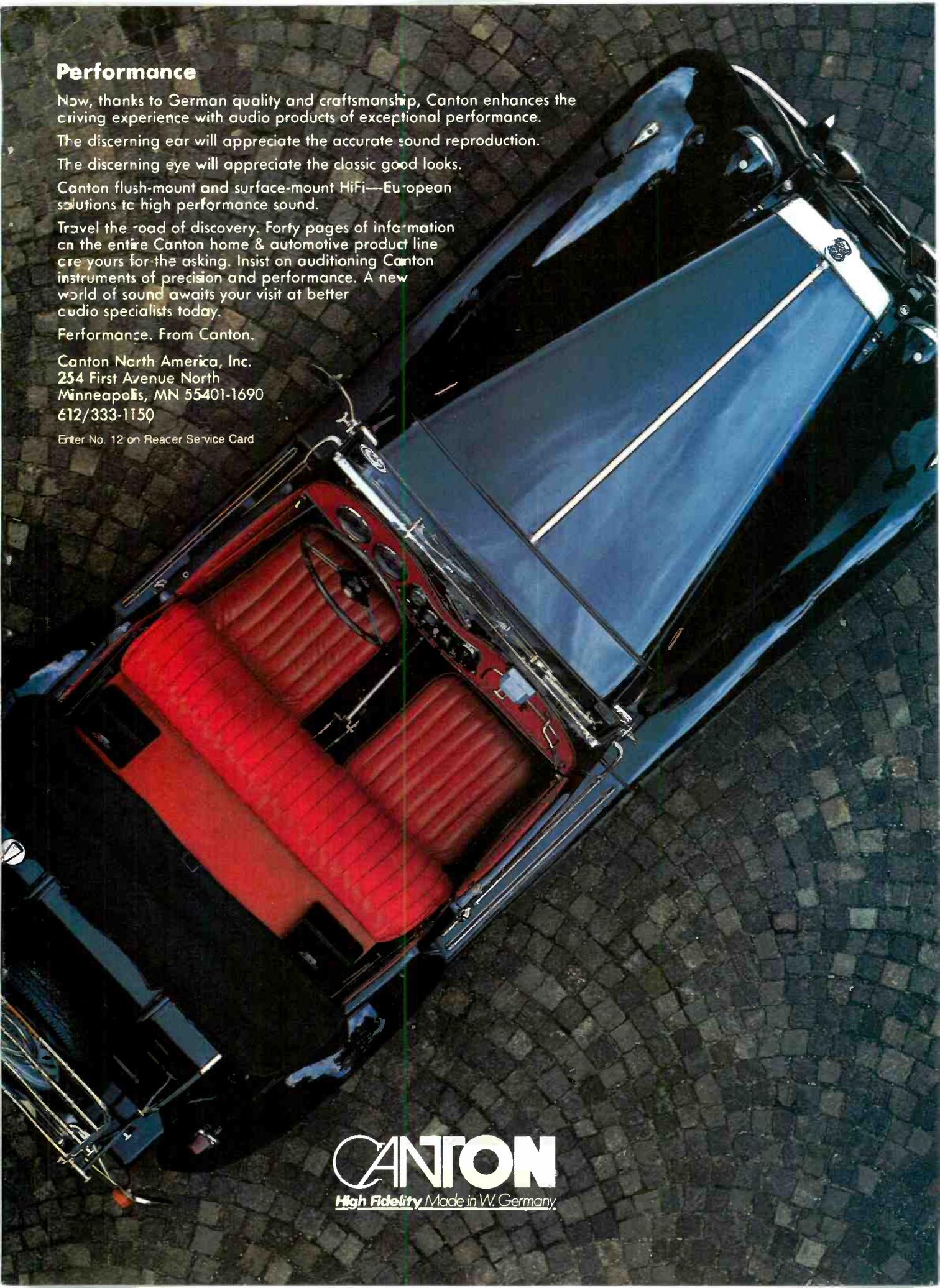
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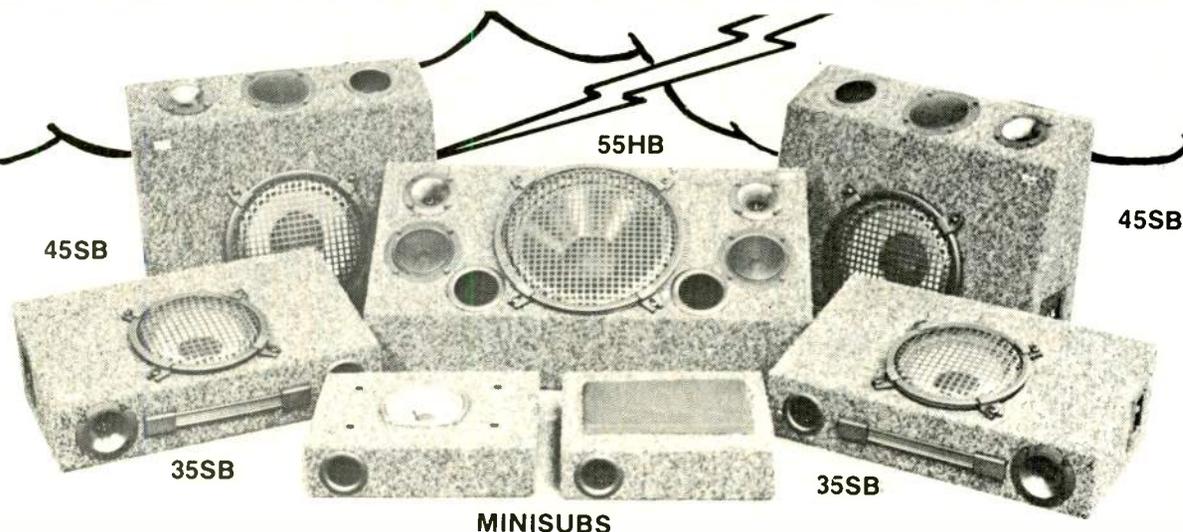
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Simply place them vertically behind truck bench seats or lay them flat in the cargo area of vans and hatchbacks. Carpeted cabinets stay put without scratching car interiors.

• **High Efficiency—loud volume without a large amplifier**

• **Exceptional 10-Year Limited Warranty**

• **Made in U.S.A.**

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• **Convenient Handles**

MTX 35SB, 45SB, and 55HB can easily be used as extension speakers at many outdoor (and indoor) events. Just install with extra wire—convenient handles make it easy to move these rugged speaker systems to where the action is happening.

**Powerful Mobile Speaker Systems
 making Big Sounds on and off the Road**

MTX 55HB

A 3-Way Stereo Enclosure Full Range System that's designed to fit perfectly in rear well of all late-model Firebirds and Camaros. Also fits all hatchbacks and vans. Ideally suited for use in RVs.

Sensitivity: 97dB Power Handling: 5-150 watts
 Freq. Resp.: 40HZ-22 KHz Sugg. Retail: \$249

MTX 35SB

An 8" 2-Way Full Range System that fits behind the seats of most mini-sized domestic and import trucks. Can also be placed in cargo area of all hatchbacks and vans.

Sensitivity: 94dB Power Handling: 5-100 watts
 Freq. Resp.: 60Hz-22 KHz Sugg. Retail: \$299 pair

MTX 45SB

A 10" 3-Way Full Range System that fits behind the seats of most full-size pickups. Also fits most compact hatchbacks as well as all full-size hatchbacks and vans.

Sensitivity: 97dB Power Handling: 5-150 watts
 Freq. Resp.: 55Hz-22KHz Sugg. Retail: \$399 pair

MTX Minisubs

A 5 1/4" Compact Subwoofer System that is designed to fit underneath seats to provide direct low frequency coupling to the listener.

Sensitivity: 91.5 dB Power Handling: 5-75 watts
 Freq. Resp.: 65 Hz-3 KHz Sugg. Retail: \$200 pair

MTX Loudspeakers One Mitek Plaza Winslow, IL 61089
 Phone (815) 367-3811

SPEAKERS

MANUFACTURER	Model	Price, \$ (If Sold Individually)	Price, \$ (If Sold in Pairs)	Recommended Maximum Power, Watts	Sensitivity, dB SPL (1 Watt/1 Meter)	Impedance, Ohms	Frequency Response, Hz to kHz, ± dB	DRIVERS										Notes
								Subwoofer Only (S)	Woofer Only (W)	Midrange Only (M)	Tweeter Only (T)	Woofer Size, Inches	Whizzer (W), 2-Way (2) 3-Way (3), 4-Way (4)	Agood Tweeter(s) = A, Pinpoint Tweeter(s) = P	Separately Mounted Drivers?	Flush Mount (F), Surface Mount (S), Coverplate (C), Page (P)	Maximum Required Mounting Depth, Inches	
SHERWOOD	SX 693	149.95	100	94	4	50-20 ± 3		6 x 9	3			No	S		Yes	No		
	SX 692	129.95	100	94	4	55-20 ± 3		6 x 9	2			No	S		Yes	No		
	SX 653	109.95	75	91	4	30-20 ± 3		6 1/2	3			No	S		Yes	No		
	SX 650S	89.95	50	91	4	65-15 ± 3		6 1/2	W			No	S		Yes	No		
	SX 402	89.95	40	89	4	90-14 ± 3		4	2			No	S		Yes	No		
SONY	XS-106	49.95	45	90	4	50-20		4	W			No	F	1 7/8	Yes	Yes		
	XS-107	69.95	45	90	4	50-20		4	2			No	F	1 7/8	Yes	Yes		
	XS-307	79.95	45	91	4	35-20		5 1/4	2			No	F	1 1/4	Yes	Yes		
	XS-607	89.95	75	92	4	30-20		6 1/2	2	P		No	F	2 1/8	Yes	Yes		
	XS-696	79.95	90	93	4	30-20		6 x 9	2	P		No	F	2 3/8	No	Yes		
	XS-697	109.95	90	93	4	30-20		6 x 9	3	P		No	F	2 3/8	No	Yes		
	XS-417	129.95	75	91	4	30-20		4 x 10	3	P		No	F	3 1/2	No	Yes		
	XS-311S	59.95	25	92	4	45-22		5 1/4	W			No	F	1 3/8	Yes	Yes		
	XS-315S	69.95	25	92	4	50-22		5 1/4	2	P		No	F	1 3/8	Yes	Yes		
	XS-615S	79.95	25	92	4	35-22		6 1/2	2	P		No	F	1 3/8	Yes	Yes		
	XS-695S	109.95	50	92	4	35-22		6 x 9	2	P		No	F	2 1/4	Yes	Yes		
	XS-F132	119.95	60	89	4	40-25		4	4			No	F	1 3/8	Yes	Yes		
	XS-F332	139.95	100	90	4	35-25		5 1/4	2			No	F	2	Yes	Yes		
	XS-F633	169.95	120	91	4	30-25		6 1/2	2			No	F	2 1/4	Yes	Yes		
	XS-F693	199.95	150	93	4	28-25		6 x 9	3			No	F	2 1/2	Yes	Yes		
	XS-HF3	249.95	100	90	4	50-22		6 1/2	2		Yes	Yes	F	2 3/8	Yes	Yes		
	XS-H3	149.95	150	91	4	3k-30k	T	8				No	F	3 3/8	Yes	Yes		
	XS-L201	499.95	150	91	4	30-5	W	8				No	F	3 3/8	Yes	Yes		
	XS-700	499.95	120	89	4	46-40	W	4	3		Yes	Yes	S		No	Yes		
	SPARKOMATIC	SK6920C	32.95	50	95.3	6	30-15 ± 3		6 x 9	2	A		F	3 3/8	No	Yes		
SK650		59.95	200	92	4	70-20 ± 3		6	4	A		F	2 1/4	No	Yes			
SK622T		35.95	80	96.6	4	50-17 ± 3		6	3	A		F	2 1/4	No	Yes			
SK620C		28.95	50	95	6	50-15 ± 3		6	2	A		F	2 1/4	No	Yes			
SK400		21.95	40	86	4	90-15 ± 3		4	W	A		F	1 3/4	No	Yes			
ASK3000		79.95	25	92	22	80-20 ± 3		4	2	P		F	2 1/4	Yes	Yes			
ASK3010		99.95	25	92	22	80-20 ± 3		4	2	P		F	2 1/4	No	Yes			
ASK3015		99.95	25	92	22	80-20 ± 3		4	2	A		S		No	Yes			
ASK3030		59.95	25	92	22	50-250 Hz ± 3	S	4				C	2 1/4	No	Yes			
SK410		22.95	40	86	4	90-15 ± 3		4	W	A		S		No	Yes			
SK6950		66.95	200	92	4	50-20 ± 3		6 x 9	4	A		S	4	No	Yes			
SK6922T		39.95	100	96.6	4	30-17 ± 3		6 x 9	3	A		F	3 1/2	No	Yes			
SK520C		39.95	50	95	8	60-15 ± 3		6	2	A		F	3 1/2	No	Yes			
SK415		24.95	40	86	8	90-15 ± 3		4	W	A		S		No	Yes			
SK313		11.95	10	85	8	125-8 ± 3		3				S		No	Yes			
SK355		11.95	10	88	8	100-10 ± 3		3 1/2	W	A		F	1 1/4	No	Yes			
SK692		19.95	50	96.6	4	30-15 ± 3		6 x 9	2	A		F	1 1/4	No	Yes			
SK693		24.95	80	95.3	4	30-17 ± 3		6 x 9	3	A		F	3 1/2	No	Yes			
SK690		30	30	94	4	50-12 ± 3		6 x 9	3	A		F	3 1/8	No	Yes			
SK610		14.95	40	86	4	70-12 ± 3		6	W	A		F	2 1/4	No	Yes			
SK300	24.95	60	92	8	90-15 ± 3		3	W	A		F	1 1/2	No	Yes				
SK63	24.95	60	92	8	60-16 ± 3		6	3	A		F	2 3/8	No	Yes				
SPEAKERLAB	DT75PF	60.00	150	92	8	3k-20k ± 3	T					F	7/8	Yes	No			
	DT100PF	70.00	200	93	8	3k-20k ± 3	T					F	1	Yes	No			
	DM300P	125.00	300	93	8	600-6 ± 3	M					F	1	Yes	No			
	F404P	60.00	75	91	4	200-6 ± 3	M					F	2 1/8	Yes	No			
	W525P	65.00	60	91	8	60-4 ± 3	W	5 1/4				F	2 5/8	Yes	No			
	W614P	75.00	75	92	4	50-4 ± 3	W	6 1/2				F	3	Yes	No			
	W964P	110.00	75	92	4	35-3 ± 3	W	6 x 9				F	3 1/2	Yes	No			
	W844P	125.00	200	92	4	35-3 ± 3	W	8				F	3 3/8	Yes	No			
	W1088P	85.00	75	92	8	33-200 Hz ± 3	W	10				F	4 1/2	Yes	No			
	W1228P	95.00	200	93	8	28-7 ± 3	W	12				F	5 3/8	Yes	No			
W1555PA	150.00	100	93	4	20-150 Hz ± 3	S	15				F	6 1/2	Yes	No				
SPECO	SK4C10	69.00	40	88	4	50-20		4 x 10	2	P		F	1 1/2	No	No			
	SK4120C	79.95	50	86	4	50-20 ± 3		4	2	P		F	3	No	No			
	SK5120T	89.95	60	88	4	80-20 ± 3		5 1/4	3	P		F	2 1/4	No	No			
	SK5A5SC	59.95	40	84	4	120-18 ± 3		5	2	P		F	1 1/4	No	No			
	SK5A5S	39.95	40	84	4	110-10 ± 3		5	W	P		F	1 1/4	No	No			
	WC5110A	59.95	40	86	8	50-15 ± 3		5 1/4	2	A		C	1 3/8	No	No			
	WC5110C	44.95	40	86	8	50-15		5 1/4	W	A		C	1 3/8	No	No			
	SK4A10	54.95	30	87	4	30-17 ± 3		4	W	P		F	1 1/2	No	No			
	SK5110C	39.95	30	85	4	50-20		4	2	P		F	2	No	No			
	SK4120C	49.95	40	87	4	50-20		4	2	P		F	2 1/2	No	No			
	SK6925TD	98.00	120	89	4	30-20 ± 3		6 x 9	3	P		F	4	No	No			
	DMS-3	119.00	100	88	4	55-20 ± 3		4	3			S		No	No			
	DMS-2	89.00	60	86	4	60-20		3 1/2	2			S		No	No			
	SK6920Q	89.00	80	87	4	50-20		6 x 9	4	P		S		No	No			
	SK6920T	79.00	60	89	4	50-20		6 x 9	3	P		F	4	No	No			
SK6920C	69.00	50	88	4	50-20		6 x 9	2	P		F	3 1/2	No	No				
STILLWATER DESIGNS (Continued)	Kicker	259.95	200	4	40-39		(2)6 1/2	2	A	No	S		No	No		Mounts behind seat in pickups.		
	Side-Kicks	279.95	100	4	40-39		6 1/2	2	A	No	S		No	No		Mounts behind seat in mini pickups.		

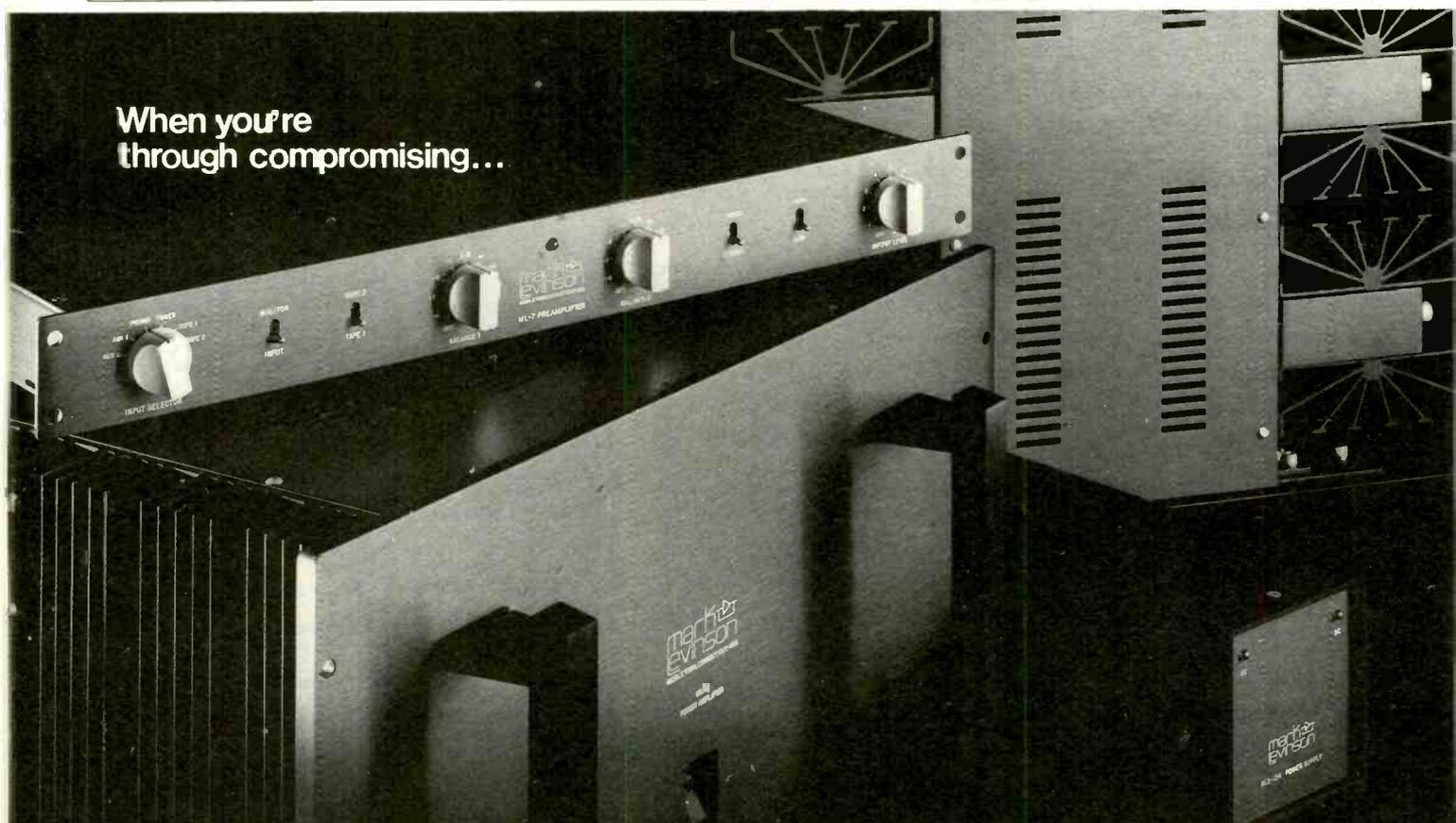
SPEAKERS

MANUFACTURER	Model	Price, \$ (If Sold Individually)	Price, \$ (If Sold in Pairs)	Recommended Maximum Power, Watts	Sensitivity, dB SPL (1 Watt/1 Meter)	Impedance, Ohms	Frequency Response, Hz to kHz, ±dB	DRIVERS										Weatherproof?	Application Guide Available?	Notes
								Subwoofer Only (S)	Woofer Only (W)	Midrange Only (M)	Tweeter Only (T)	Woofer Size, Inches	Woofer (W) 2-Way (2)	3-Way (3)	4-Way (4)	Amplifier Tweeters = A, Passive Tweeters = P	Separately Mounted Drivers?			
STILLWATER (Continued)	Super-Kicks		329.95	150	4	38-39		8	2	A	No	S		No	No	Mounts behind seat in full-sized pickups. Rear-mount in fastbacks, hatchbacks, and 4 x 4 vehicles. As above. Mounts on rear decks in cars, ceiling mount in vans, behind seat in pickups. Mounts on rear side panels in 4 x 4 vehicles and vans, on rear decks in cars. Subwoofer and satellite system.				
	Kicker II	269.95	200	4	40-39		(2) 6 1/2	2	A	No	S		No	No						
	Super II Classic	319.95 219.95	300 150	4 4	38-39 50-29		(2) 8 (2) 5	2 2	A A	No No	S S		No No	No No						
	Colts		239.95	75	4	50-29		5	2		No	S		No	No					
	Compact		279.95	75	4	40-20		5	2		Yes	S		No	No					
	F-15	155.00	150	4	30-2.5	S	15				F		6 1/4	Yes	No					
	F-12	110.00	150	4	30-2.5	S	12				F		5 1/8	Yes	No					
	F-10	92.50	150	4	30-2.5	S	10				F		4 1/4	Yes	No					
	F-8	67.50	100	4	35-3	W	8				F		3 1/4	Yes	No					
	F-6 x 9	67.50	100	4	35-3	W	6 x 9				F		3 1/4	Yes	No					
	F-6 1/2	62.50	100	4	35-3	W	6 1/2				F		3	Yes	No					
	C-15	155.00	150	4	30-2.5	S	15				F		6 1/4	Yes	No					
	C-12	110.00	150	4	30-2.5	S	12				F		5 1/8	Yes	No					
	C-10	92.50	150	4	30-2.5	S	10				F		4 1/4	Yes	No					
	C-8	67.50	100	4	35-3	W	8				F		3 1/4	Yes	No					
	C-6 x 9	67.50	100	4	35-3	W	6 x 9				F		3 1/4	Yes	No					
C-6 1/2	62.50	100	4	35-3	W	6 1/2				F		3	Yes	No						
SUNKYONG	SSP-6935		75.00	120	90	4	40-20 ± 3		6 x 9	3	P	No	F		Yes	Yes				
	SSP-6920		60.00	100	89	4	40-20 ± 3		6 x 9	2	P	No	F		Yes	Yes				
	SSP-5135		50.00	90	89	4	60-19		5 1/4	3	P	No	F		Yes	Yes				
	SSP-512C		45.00	90	89	4	60-19		5 1/4	2	P	No	F		Yes	Yes				
	SSP-401D		30.00	50	87	4	50-18		4	2	P	No	F		Yes	Yes				
	SSP-402C		40.00	60	87	4	50-20		4	2	P	No	F		Yes	Yes				
TECHNICS	EAB-C45		64.95	60	92	4	50-22		4	2	A	No	F		Yes	Yes				
	EAB-C65		84.95	80	92	4	35-22		6 1/2	2	A	No	F		Yes	Yes				
	EAB-C95		99.95	80	94.5	4	30-22		6 x 9	2	A	No	F		Yes	Yes				
	EAB-F400		99.95	100	92	4	40-20		4	2	A	No	S		Yes	Yes				
	EAB-F600		129.95	120	92	4	30-22		6 1/2	2	A	No	S		Yes	Yes				
	EAB-F900		149.95	150	94.5	4	30-22		6 x 9	3	A	No	S		Yes	Yes				
ULTIMATE SOUND	HXC 6935		139.95	100	92	4	38-22 ± 4		6 x 9	2		No	F		3 1/2	Yes				
	HXC 7035		139.95	100	92	4	38-22 ± 4		7	2		No	F		3 1/2	Yes				
	HXC 6510		99.95	60	92	4	55-22 ± 4		6 1/2	2		No	F		1 5/8	Yes				
	HXC 4006		69.95	40	92	4	72-22 ± 4		4	2		No	F		1 5/8	Yes				
	HC 3506		34.95	25	89	4	138-12 ± 4	M					F		1 5/8	Yes				
	HCD 202		159.95	50	89	4	46-22 ± 4		5	2		Yes	C			Yes				
	HCP 102		119.95	50	90	4	56-22 ± 4		5	2		Yes	P		1 5/8	Yes				
	PC 6920TX		79.95	75	92	4	44-19 ± 4		6 x 9	3		No	F		3	Yes	Yes			
	PC 6920CX		69.95	75	92	4	44-19 ± 4		6 x 9	2		No	F		3	Yes	Yes			
	PC 6510TX		64.95	45	92	4	58-19 ± 4		6 1/2	3		No	F		2 1/8	Yes	Yes			
	PC 6510CX		54.95	40	92	4	58-19 ± 4		6 1/2	2		No	F		2 1/4	Yes	Yes			
	PC 4006CX		49.95	25	91	4	69-19 ± 4		4 x 6	2		No	F		1 3/4	Yes	Yes			
	PC 4006CX		44.95	25	90	4	74-19 ± 4		4	2		No	F		2	Yes	Yes			
	PC 3506CX		34.95	20	89	4	108-19 ± 4		3 1/2	2		No	F		1 3/8	Yes	Yes			
	PC 202		119.95	50	90	4	50-19 ± 4		4 1/2	2		Yes	C			Yes	Yes			
	NPTY 6920		59.95	60	92	4	48-19 ± 4		6 x 9	3		No	F		2 3/4	Yes	Yes			
	NPCX 6920		54.95	60	92	4	48-19 ± 4		6 x 9	2		No	F		2 3/4	Yes	Yes			
	NPTY 6510		49.95	50	92	4	60-19 ± 4		6 1/2	3		No	F		2	Yes	Yes			
	NPCX 6510		44.95	45	92	4	60-19 ± 4		6 1/2	2		No	F		2	Yes	Yes			
	NPW 4606		24.95	25	92	4	65-17 ± 4		4 x 6	W		No	F		1 5/8	Yes	Yes			
	NPW 4006		24.95	20	91	4	76-17 ± 4		4	W		No	F		1 3/8	Yes	Yes			
	NPW 3506		19.95	15	89	4	140-17 ± 4		3 1/2	W		No	F		1 3/8	Yes	Yes			
	NPD 202		79.95	50	92	4	52-19 ± 4		4 1/2	2		Yes	P			Yes	Yes			
	HC 6935	59.95	100	91	4	34-5	S	6 x 9				F		3 1/2	Yes	Yes				
	HCS 7035	59.95	90	91	4	34-5	S	7				F		3 1/2	Yes	Yes				
	HC 6910		99.95	70	92	4	56-2.5	W	6 x 9			F		2	Yes	Yes				
	HC 8010		99.95	70	92	4	50-2.5	W	8			F		2	Yes	Yes				
	HCS 6510		89.95	60	92	4	75-5	W	6 1/2			F		1 7/8	Yes	Yes				
	HC 6510		89.95	60	92	4	65-5	W	6 1/2			F		2 5/8	Yes	Yes				
	HC 4510		49.95	45	92	4	92-4.5	M				F		2	Yes	Yes				
	HCS 5010		74.95	40	90	6	98-5	M				F		1 1/2	Yes	Yes				
	HCT 200	14.95	70	88	4	3.5k-18k ± 4	T					F		3/4	Yes	No				
	HCT 100		89.95	100	92	6	2.5k-25k ± 4	T				F		1	Yes	No				
	UTS 4065BP		34.95	40	90	8	2.5k-20k ± 4	T				F		1 1/2	Yes	No				
	UT 01CP		34.95	100	89	8	5k-22k ± 4	T				F		3/8	Yes	No				
	UWP 1035	64.95	140	4	20-3 ± 4	S	10					F		3 1/2	Yes	Yes				
	UWP 1020A	39.95	100	4	28-3 ± 4	S	10					F		3 1/2	Yes	Yes				
	UWP 8035	54.95	120	4	30-3 ± 4	S	8					F		3 1/2	Yes	Yes				
	UWP 8020A	29.95	100	4	38-4 ± 4	S	8					F		3 1/4	Yes	Yes				
	UWP 6935	54.95	140	4	30-5 ± 4	S	8					F		3 1/2	Yes	Yes				
	UWP 6920A	29.95	90	4	40-6 ± 4	W	6 x 9					F		3 1/4	Yes	Yes				
	UWP 6525	44.95	120	4	42-6 ± 4	W	6 x 9					F		3	Yes	Yes				
	UWP 6520A	24.95	80	4	45-5 ± 4	W	6 1/2					F		2 7/8	Yes	Yes				
	UMP 5210P		49.95	50	4	80-10 ± 4	M					F		2 1/8	Yes	Yes				
	UMP 4010P		44.95	50	4	120-10 ± 4	M					F		1 1/8	Yes	Yes				
	UTS 3510P		54.95	50	92	8	2.5k-19k ± 4	T				F		3/4						
	UTR 3510P		54.95	50	92	8	2.5k-19k ± 4	T				F		3/4						
	(Continued)	UT 01XP		89.95	100	91	6	6.5k-30k ± 4	T				F		1		Ribbon super-tweeter.			

SPEAKERS

MANUFACTURER	Model	Price \$ (If Sold Individually)	Price \$ (If Sold in Pairs)	Recommended Maximum Power, Watts	Sensitivity, dB SPL (1 Watt / 1 Meter)	Impedance, Ohms	Frequency Response, Hz to kHz, \pm dB	DRIVERS										Notes			
								Subwoofer Only (S), Woofer Only (W), Midrange Only (M), Tweeter Only (T)	Woofer Size, inches	Woofer (W) 2-Way (2), 3-Way (3), 4-Way (4)	Angled Tweeters (A) = A, Porthole Tweeters = P	Separately Mounted Drivers?	Flush Mount (F), Surface Mount (S), Convertible (C), Plate (P)	Maximum Required Mounting Depth, inches	Weatherproofed?	Application Guide Available?					
ULTIMATE SOUND (Continued)	UT 01D	14.95		100	89	4/8	5k-22k \pm 4	T													
	HCB 3400B			100	4	4	36-20		(2) 8	3	A	Yes	C	1/2	No						
	HCB 300B			180	4	4	40-20		(2) 8	2	A	Yes	C		No						
	HCB 200B			100	4	4	40-20		(2) 8	2	A	Yes	C		No						
	HCB 120B			80	4	4	50-20		(4) 5	2	A	Yes	C		No						
	UBC Hatchback			100	4	4	40-20		(2) 8	2	A	Yes	C		No						
	UBC Pickup			100	4	4	45-20		(2) 8	2	A	Yes	C		No						
	UBC PB UBC Oak			100 100	4 4	4 4	45-20 45-20		(2) 8 (2) 8	2 2	A A	Yes Yes	C C		No No						
ULTRX	US10		200.00	50	93	4	60-20		5 3/4	3		No	F	2 1/4	No	No					
VISONIK	D5001		234.00	50	82	4	50-25 \pm 3		4	2		No	S		No						
	D5202		180.00	50	85	4	50-20 \pm 3		4	2		No	F	1 1/2	No						
	D7200		250.00	70	88	4	50-20 \pm 3		5 1/4	2		Yes		1 3/4	No						
YAMAHA	YCS-300		100.00	60	90	4	3.5k-20k \pm 3	T						C	3/4	Yes	No				
	YCS-301			40	88	4	5k-20k	T						C		Yes	No				
	YCS-350		45.00	50	89	4	80-20							C	1 3/4	Yes	No				
	YCS-400		65.00	80	88	4	70-20 \pm 3		4	W		No	C	1 7/8	Yes	No					
	YCS-401		100.00	80	88	4	70-20		4 1/2	2		No	C	1 5/8	Yes	No					
	YCS-460		90.00	60	90	4	70-20		4 x 6	2		No	C	1 7/8	Yes	No					
	YCS-500		90.00	100	88	4	60-10 \pm 3		5			No	C	2 3/8	Yes	No					
	YCS-501		100.00	80	89	4	60-20	W	5			No	C	1 5/8	Yes	No					
	YCS-530II		210.00	100	88	4	50-20			2		No	C	1 1/4	Yes	No					
	YCS-600		110.00	100	91	4	60-20		6 1/2	2		No	C	2	Yes	No					
	YCS-601		170.00	120	90	4	60-20		6 1/2	2		No	C	2 1/8	Yes	No					
	YCS-602		110.00	120	90	4	55-10 \pm 3		6 1/2	2	A	No	C	2 5/8	Yes	No					
	YCS-603		100.00	100	90	4	60-20		6 1/2	2		No	C	2	Yes	No					
	YCS-690		150.00	120	91	4	40-20 \pm 3		6 x 9	2	A	No	C	2 7/8	Yes	No					
	YCS-691		190.00	120	91	4	40-20 \pm 3		6 x 9	2		No	C	2 7/8	Yes	No					
	YCS-692		120.00	120	90	4	40-20		6 x 9	2		No	C	2 7/8	Yes	No					
	YCS-800		150.00	200	92	4	20-1 \pm 3	S	8			No	C	2	Yes	No					

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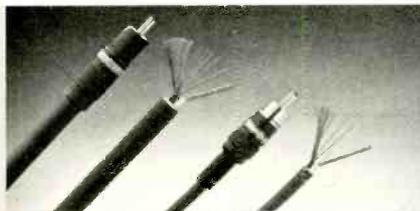
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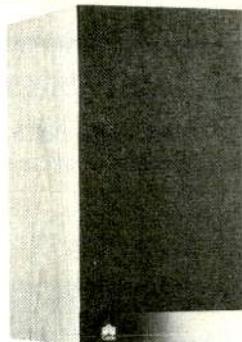
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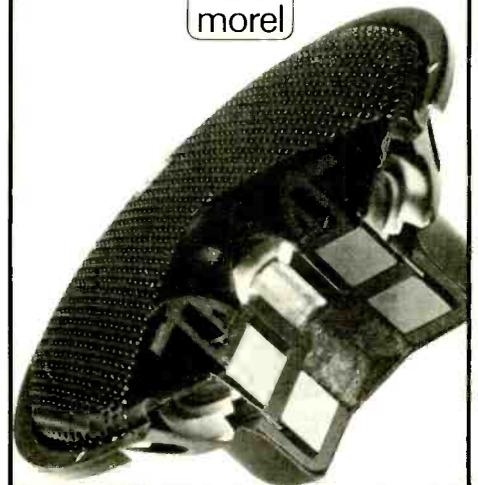
Power Handling Capacity	120 Watts RMS
Frequency Response	35-25000 Hz
Woofer Type	8" Dia., 3" Aluminum voice coil
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Sensitivity 1W/1M	92 db
Magnetic Structure Weight	2.3 lbs / 1.05 Kgs
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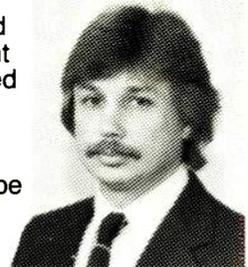
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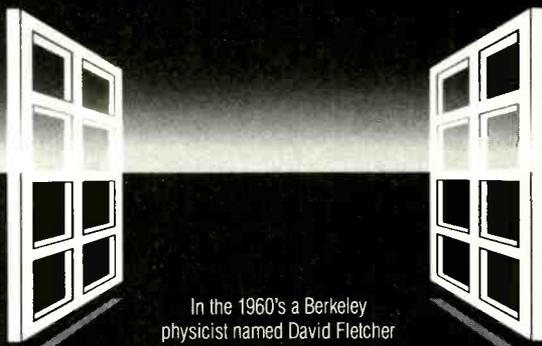
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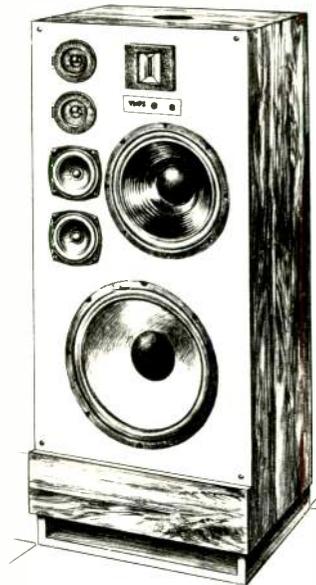
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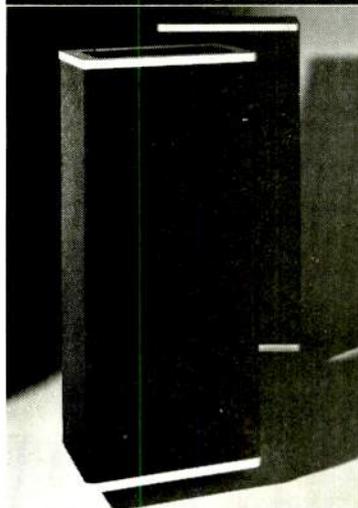
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		TEXAS	
		Beaumont	KVLU
		College Station	KAMU
		(Austin)	KRED
		Corpus Christi	WRR 7 PM Sat
		Dallas ***	KTEP 10 PM Thur
		El Paso	
		VIRGINIA	
		Richmond	WRFK
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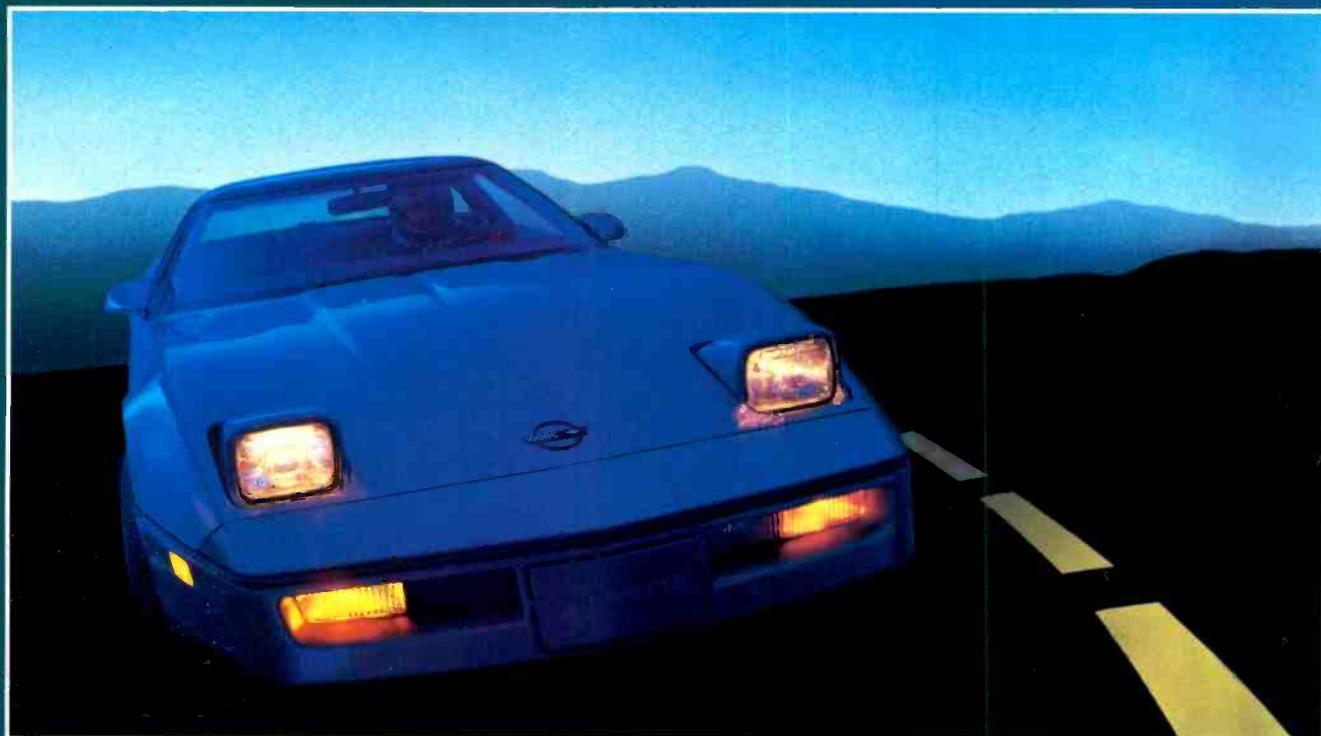


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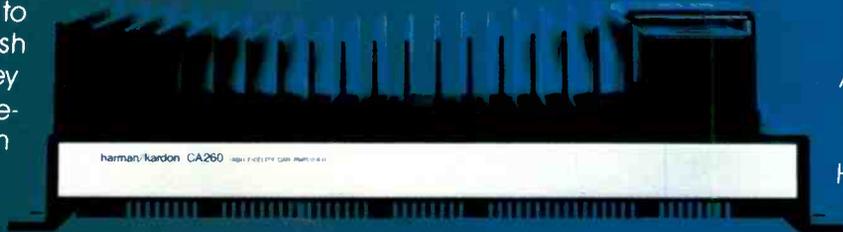


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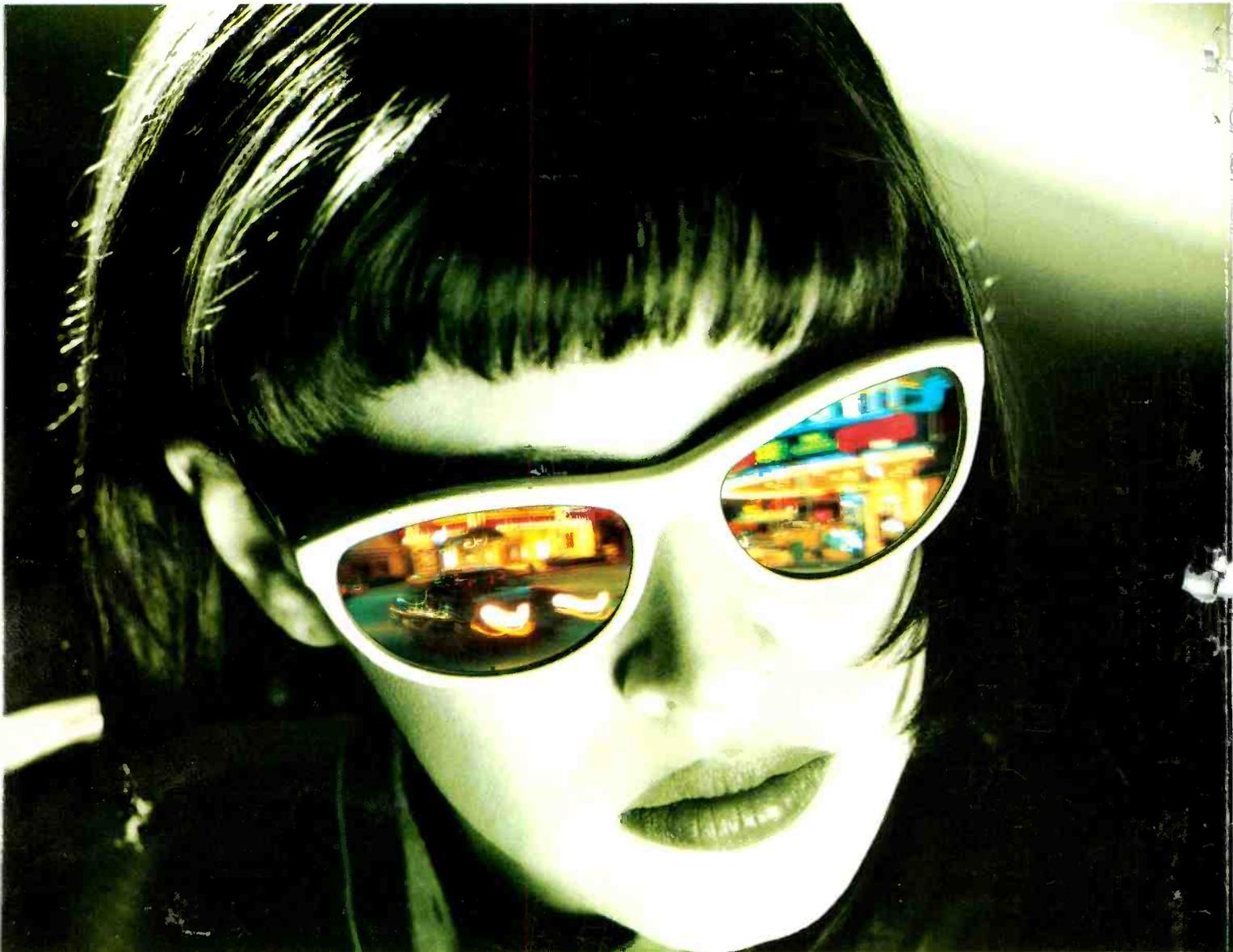
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