

Stereo Review Presents

Display until January 26, 1987

\$3.95

# COMPACT DISC

## BUYERS' GUIDE 1987

### SPECIAL FEATURE ARTICLES ON

- How to Buy a CD Player
- High-End CD Players
- Portable CD Players
- CD Accessories
- CD for the Car
- CD and DAT
- CD Basics
- and more!

*Product listings with specs, descriptions, and prices of home CD players, portable models, CD changers, car options, and more!*





# Audio

**MASS TEST  
49 CASSETTES**

IS THIS  
EARM?

Rating: ★ ★ ★ ★ ★

In several measurements, the DCD-1500 out-performed any other player.

**SAPPHIRE  
DENON DCD-1500  
CD PLAYER**

ing Tests

I am sometimes influenced by what I measure when it comes time to judge a production quality. I'm convinced that I expect to hear. To me, the sound of several CD players whose measurements were as good as this one's. I tried players who own CD players and the / were listening to their own listening to the Denon, both of and of the DCD-1500 over that

that, ultimately, there is a results and audible results— are made. Happily, that the DCD-1500. It not only was easy to use via its controls, but it sounded t so far. What's more, of some of my other look on every count. Leonard Feldman

UDIO/JUNE 1986

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asten, allesam  
verschiedenen Fu  
ppen zusammengefabt.

Audio 4/1986

**Denon DCD-1500**



Preis: um 1600 DM  
Garantie: 12 Monate  
Abmessungen: 43,4 x 8,9 x 3E cm (BxHxT)  
Denon Electronics GmbH  
Halskestraße 32  
4030 Ratingen 1

**Pro und Kontra**  
→ Klang  
Ausstattung  
Verarbeitung  
Fernbedienung  
+ Fernbedienung

**Preisbezogene Wertungen**  
Klang: sehr gut  
Fehlerkorrektur: gut bis sehr gut  
Ausstattung: sehr gut  
Verarbeitung: sehr gut

**HIFI VISION-Urteil**  
Preisbezogenes Gesamturteil: sehr gut  
Absolute Einstufung: Referenzklasse

The audio critics of the world hardly ever agree on anything. But when it comes to superlative CD players, Ken Pohlmann, Len Feldman, Masamitsu Fukuda, Ulrich Smyrek, David Praker, Yoshiyuki Ishida, Artur Jung, and Hidec Kaneko recommend one model with amazing consistency: the Denon DCD-1500.

How did Denon achieve this exalted status? Not by offering useless buttons, switches and fluorescent displays. But by developing better digital circuitry, building to higher standards, and using better parts. Our proprietary Super Linear Converter is the only one that actually corrects D/A transfer distortion. Each circuit gets its own separate power supply. And our filters are computer-analyzed for linear phase. So you hear sound that rewards the most critical listening.

In a player as reasonably priced as the DCD-1500, these refinements are enough to make even a hard-boiled critic stand up and cheer. And now there's more cause for celebration: three new Denon CD Players. They're built on the same principles as the DCD-1500, and they're even more affordable.

So if you want to hear the best that the Compact Disc format has to offer, get yourself to a Denon dealer. And don't forget to tell him who sent you: Ken, Len, Masamitsu, Ulrich...

# DENON

DESIGN INTEGRITY



DCD-1500: Dual Super Linear Converters; Oversampling Digital Filters; CALP Analog Filters; Programming; Remote Control.



DCD-1300: Super Linear Converter; Oversampling Digital Filters; Real-Time Phase Correction; Programming; Remote Control.



DCD-700: Super Linear Converter; Real-Time Phase Correction; Programming; Remote Control; Headphone Jack with Level Control.



DCD-500: Super Linear Converter; Real-Time Phase Correction; Programming; Emphasis Display; Headphone Jack.

offers  
price. The u  
sampling dual D  
excellent error correctio  
The DCD-1500's audio qual  
tight sound of some players.

# COMPACT DISC

## BUYERS' GUIDE 1987

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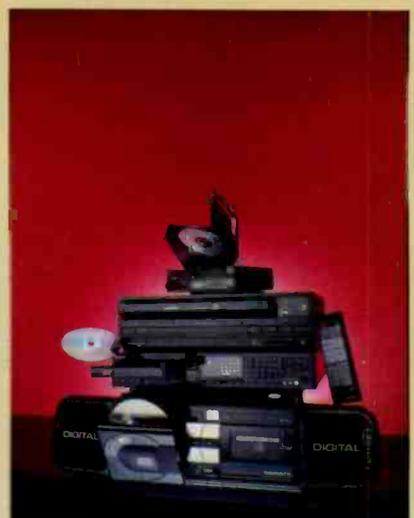
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Cover components (top to bottom): Technics SL-XP8 portable CD player (see product listing on page 137); Yamaha YCD-1000 car CD player (page 143); Pioneer CLD-909 CD/LaserDisc player (139); Sony 620ES home CD player (page 130); Magnavox CD880 CD boombox (page 134).

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 Guide, 1987 Edition



## *A Dream Fulfilled*

Perfection is an elusive goal...all the more elusive  
when near-perfection can be achieved easily.

And so it is with Compact Disc Players.

If CD players seem to sound the same...listen carefully.

An unnatural stridency

—especially during quiet passages—  
shatters the dream.

When we discovered the reason—

tiny “glitches” created during D/A conversion—  
we developed a unique “Glitch-Free” converter.

And then we added a special power supply  
that completely isolates the digital and analog circuitry.

Hear the promise of digital sound finally fulfilled by the

Nakamichi OMS-7AII and OMS-5AII

Compact Disc Players that rise above the ordinary  
and fulfill the dream!



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CIRCLE NO. 8 ON READER SERVICE CARD

# HOW TO BUY A CD PLAYER

**D**IGITAL recording technology and the Compact Disc system have brought change to almost every aspect of hi-fi. Music is recorded and played back differently, and without the annoyance of tape hiss and the ticks and pops of LP surface noise, it actually sounds different. The generally superior sound quality of the CD system is apparent even to audio novices. Everyone I know who has heard a Compact Disc system demonstrated in a home listening room has wanted to buy one.

The speed with which the American public embraced the video cassette recorder was phenomenal. Figures for sales of CD players in the scant three years since they were first offered to American consumers show that the Compact Disc is being accepted at an even faster rate than the VCR.

Your first question in considering the purchase of a Compact Disc player might well be: Is this a good time for me to buy one? The answer to that question is a resounding Yes.

Obstacles to sales in 1983 were the high prices of players and the limited selection of music available on Compact Discs. Both obstacles have been overcome.

by *William Livingstone*

Prices have been reduced dramatically, and there is tremendous variety in the kinds of music available

on the four to five thousand Compact Discs listed in current catalogs.

Prices now range from less than \$200 for a few players marketed under brand names that have not been long associated with hi-fi equipment to more than \$1,500 for players with special features. No matter what your budget is, you should therefore be able to find a unit that will permit you to enjoy the benefits of this revolutionary advance in audio technology.

Before you go shopping you should think a bit about the way you listen to music and how you will use your CD player so that you can judge the appropriateness of various features for you. Each extra bell or whistle adds something to the cost of the unit and may add clutter to the control panel and needless complication to the way you operate the machine. I tend to be a minimalist when it comes to features, but there is no reason why you should deny yourself the convenience and pleasure of any of the tricks a CD player can perform, and features constitute one of the principal grounds on which you should base your choice.



*An elementary approach that stresses features and simplicity of operation rather than the elusive difference in sound*

**Remote control.** Manufacturers of television sets have taught us to enjoy the convenience and sense of power that comes from changing channels without leaving one's easy chair—or hot tub for that matter. Similarly, it is very handy to be able to control your CD player from your favorite listening spot. If you listen primarily to pop, rock, or jazz albums made up of many short selections, it is particularly useful to be able to skip a band you don't care for without leaving your seat. Infrared wireless remote controls either come with many of the units that cost more than \$500 or \$600 or are available as options.

**Access functions.** An advantage the turntable has over the tape cassette is the comparative ease with which you can locate a particular band on an LP or even a passage of music within a band. Designers of CD players have worked very hard to make it easy to gain quick access to desired passages on a Compact Disc with pinpoint accuracy.

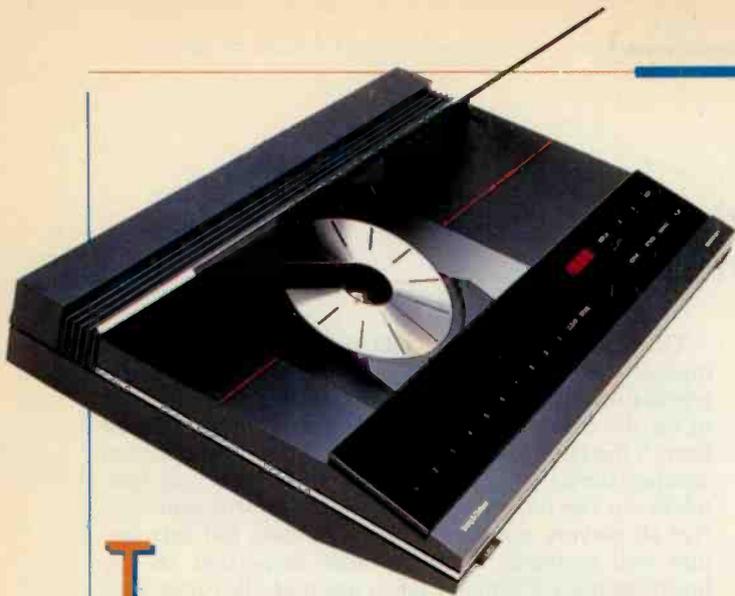
CD's are divided into numbered bands or *tracks*. If you want to play Track 9, you may have to press a button nine times to select it. But some players have direct access for quicker service—press 9 on a button or key pad and Track 9 is played.

The bands or tracks on a CD may be subdivided with digitally encoded indexing points, which break the tracks down into smaller sections so that you can zero in on the exact part of a piece of music you wish to hear. This is particularly useful with lengthy classical compositions, which may have only three or four tracks for the movements of a concerto or symphony. Not all players can access by index code, but this feature will probably become more important in the future as more Compact Discs are manufactured with indexing cues encoded on them.

There are various scanning and searching functions that give additional flexibility in finding the passages you want to play. You may find it helpful to have audible fast scanning of a disc. Some units have search systems that play the first few seconds of each track until you find one you want to hear.

**Programming.** Random-access programming is probably the most highly touted convenience feature on CD players. It makes it possible for you to be a disc jockey, reprogram the order of the tracks on a Compact Disc, and play them back in whatever rearranged sequence you wish. Players vary widely in the number of selections they can program.





**T**he top-loading Beogram CDX from Bang & Olufsen looks very different from other players.

If you listen primarily to classical music, it is not likely that you will want to scramble the scenes of an opera or the movements of a symphony and reprogram them out of their normal sequence. But if you listen to a lot of pop albums and if you enjoy putting machinery through its paces, you can have a lot of fun programming a CD player. One Magnavox unit can remember instructions for 785 tracks from different discs.

A programming refinement I like is the Random Play feature on the Pioneer PD-M6 Multi-Disc player. This permits you to leave the random sequence in which the tracks are played to the machine. Giving a pleasant element of novelty to familiar albums, this feature is also available on other players, such as some Sony models on which it is called Shuffle Play.

**Displays.** The display panel on all the players will tell you which track is being played. A considerable amount of additional information can be called up on certain players—such as elapsed playing time or remaining playing time on a track or disc—which is useful if you do a lot of home taping.

**Headphones.** There are people who maintain that listening via headphones is the best way to appreciate Compact Discs (or any other kind of recorded music), but not all CD players are equipped with headphone jacks. If you want this feature, look for a unit that also has a separate volume control.

### Special Options

**Portability.** The small Sony and Technics portable CD players are marvels of engineering and miniaturization. When Sony introduced the D-5 at \$299.95 in 1984, it was not only the smallest available CD player, but the cheapest. Since it could be used as an add-on unit for a home system, it was viewed not just as a classy way to take CD's on the road, but as an inexpensive way to play Compact Discs at home.

If you know that you will take advantage of the portability of these units, it would make sense to consider buying one and using it at home as well. But I would not recommend that you choose one of these if you

intend to use it only with your home system. At this same low price both Sony and Technics, as well as many other manufacturers, now have weightier units that are designed for home use and are easier for those with big hands to operate.

**Multi-Play.** Toshiba has a unit, the Model XR-V22, which can play two CD's in sequence or can be programmed to alternate back and forth between them.

The Pioneer PD-M6 changer will play up to six CD's in sequence, in your programmed order, or in an automatically selected random order. Its ability to provide more than six hours of music makes it ideal for anyone who wants long stretches of background music at home, in a doctor or dentist's waiting room, or even, I suppose, in a bar or restaurant.

Nikko has a changer that accommodates *sixty* CD's. Sony makes a changer for use in automobiles, so it is reasonable to expect a home changer from them before long and changers from other manufacturers as well.

**Special circuitry.** If you often play music just for background listening, you may find that the wide dynamic range afforded by Compact Discs means that the volume drops too low or becomes obtrusively loud for your purposes. In that case you might consider the Model DX 3 from dbx. Its special circuitry includes a compression control that evens out the volume peaks and valleys for smoother background listening. Also included is a signal-processing circuit to increase or decrease the spaciousness of the sound field.

The Carver CD Player includes the Digital Time Lens, a special circuit designed to improve the quality of improperly recorded Compact Discs. It can be switched out for playing correctly made recordings.

**CD plus Video.** I hope you haven't written off Pioneer's LaserDisc home video system. Pioneer hasn't. In fact, the system has been upgraded so that new LaserDiscs have digital audio soundtracks. Consequently, it is not surprising that Pioneer has introduced a machine that plays both Compact Discs and LaserDiscs, the Model CLD-900. Similar units (manufactured by Pioneer) are available from Luxman, Teac, and NAD.

After you have considered the convenience features and other options available to you, you can look for a CD player whose features mesh with your listening habits. You can do a little advance window shopping in test reports and manufacturers' ads in this magazine or the listings in the Equipment Buying Guide section of the February issue. That way, when you get to the store, you can already have an idea of a number of



**S**pecial circuitry on dbx's DX 3 can provide compression for background listening.

# BEYOND CONVENTIONAL AUDIO



## THE ONKYO INTEGRA DX-320 WITH OPTO-COUPLING THE SOUND IS NO ILLUSION

The Integra DX-320 Compact Disc player is the first of ONKYO's new generation of CD players to incorporate our unique Opto-Coupling digital signal processing system. Conventional CD players transmit digital data internally via printed circuit board wiring, which interacts with analog audio signals to produce Digital Signal Interference (DSI), resulting in an audible "harshness" in the music.

Specially designed high speed Opto-Coupling modules in the DX-320 transfer the digital audio and other data signals to the analog output stage via fiber optics, preventing DSI. The result is noise-free, life-like reproduction with none of the harsh sound characteristics often attributed to other CD players. This remarkable new technology can only be found in the ONKYO DX-320.

Double oversampling and digital filtering greatly improve phase and harmonic accuracy. A fully programmable wireless remote control includes memory selection, phrase capability, and indexing for maximum convenience.

Our unique transport design incorporates ONKYO's exclusive Poly-Sorb, a rubber-like compound that improves isolation by absorbing extraneous vibrations, eliminating skipping and mistracking.

The Integra DX-320 Compact Disc player fulfills the promise of digital audio, with sound quality that's as close to the original as anything you've ever heard. Audition the DX-320 at your authorized ONKYO dealer today.

*Artistry In Sound*

# ONKYO®

200 Williams Drive, Ramsey, N.J. 07446



**S**ony's 620ES has a twenty-function remote control and very quick access.

actual models that have the features you want and are in your price range. Obviously, as in shopping for any kind of product, you will give preference to a CD player made by a company whose reputation for quality and service you respect.

### *In the Store*

Only in the store can you really assess a unit's look and feel. Most stores other than the cheapest discount outlets will let you operate the basic functions of a CD player in order to get a feel for it. In giving buying advice on any kind of equipment, I always lean heavily on human engineering. It has been my experience that one does not get used to a button or knob that is awkward to operate. It merely becomes more irritating with time.

Operate the **PLAY**, **PAUSE**, and **FAST FORWARD** functions, for example. Are the buttons and key pads of a size that is suitable for your fingers? Are they clearly marked so that you will not have to use a flashlight and magnifying glass to operate them at home?

Does the unit feel rugged and well made? You pay extra for ruggedness, and you should expect the ADS CD 3, for example, to give a greater feeling of solidity, precision, and quality than, say, the Emerson CD 150. The ADS player weighs 20 pounds and lists for \$895. The Emerson player weighs less than 10 pounds and is widely available for less than \$200.

Check the speed with which a unit responds to its controls. How long does it take to find a track you have punched in for play? Outside the dentist's chair, the longest seconds in my life are probably those few that it takes for the tonearm of a semi-automatic turntable to return to its rest. CD players vary considerably in the time they take to search for and find a particular track and even in the time it takes for the loading door or drawer to open.

Most CD players are front-loading with a drawer that slides out to receive the disc you want to play. There are a number of top-loading machines for you to choose from, however, if that method seems easier or more natural to you. But remember that a front-loading machine usually requires less shelf room for easy operation than a top-loading model and fits more easily into a rack-mounted or "tower" installation.

Don't apologize for being interested in the way a unit looks. Many people respond to the sturdy, almost industrial appearance of Carver equipment. Others like Bang and Olufsen's Scandinavian styling. If you are tired of the aluminum look or the black that has become basic in audio equipment, there are many shades of gray in between, and Luxman even has an opulent gold-toned line.

Once you get a CD player, I predict that you will be using it a lot, and it's important to buy one that you

will enjoy looking at and handling. If you are interested in extensive programming and indexing functions, take along a CD with numerous tracks and encoded indexing points when you go shopping and hope that a cooperative salesperson will permit you to operate a player's programming features. If not, perhaps he or she will demonstrate it for you.

In the store you should also check for shock resistance by tapping the unit's case at different points while it is playing to see if physical impacts cause it to mistrack or shut off. If a player mistracks simply from your operating its controls, it is either defective or too touchy for you to consider, but you needn't subject it to assault and battery or kick its tires.

You can generally give extra preference points to recent models. Our Hirsch-Houck Laboratory tests showed that a group of \$300 CD players current during the latter part of 1985 outperformed most of the players that sold for three or four times that price in 1983. I find that most new models are easier to operate and respond with greater speed.

Don't bother to try to make comparison tests of the error-correction abilities of players you are considering. If you keep your Compact Discs in good condition, any CD player that is operating properly will play them without problems.

### *Technology and Specifications*

Should you look for a unit that has digital instead of analog filters? What is oversampling? Are three-beam laser devices better than one? Our more technically oriented readers will, of course, want to know as much as possible about how a CD player works and what is going on inside its case. But just as good speakers can be produced using any one of a variety of design approaches, so can CD players. Many inexpensive players have three-beam lasers, and top-of-the-line



*The optional remote control for the ADS CD3 also operates other ADS Atelier components.*



# UNPRECEDENTED INTRODUCTORY OFFER.

## BUY A NEW SHURE SV40 CD PLAYER. GET A SHURE V15 TYPE IV-MR CARTRIDGE WORTH \$180—FREE.



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The V15 Type IV-MR provides not only superb sound reproduction, but also excellent protection against wear and damage to your invaluable record collection. It will enable you to continue enjoying albums that could be impossible to replace at any price.

### INTRODUCING THE NEW CD PLAYER WITH THE FAMILIAR OLD NAME.

Two qualities made the Shure name famous and our new SV40 CD Player has both. Flawless sound quality. And long-term dependability. This

feature-packed player even offers the convenience of a 17-function remote with volume control that lets you program up to 15 tracks in any order you choose. All at a surprisingly affordable price.

### OUTSTANDING SOUND.

Crisp, clear sonic quality comes through via full 16-bit digital processing. The SV40 also offers sophisticated Dual Break Point™ filter sets that remove extraneous high frequency energy without affecting the music. Our **LONGLIFE™** 3-beam laser tracking system automatically compensates for disc imperfections, to make certain nothing interrupts the flow of incredible sound.

### LONG-LIFE DEPENDABILITY.

Unlike some competitive units

requiring air vents and cooling fins, the SV40 utilizes highly efficient, cool-running components designed to extend the operating life of its solid state laser, digital processing circuitry, and mechanical systems. That's why you can expect more than 7,000 hours of listening pleasure, free from worry about the high cost of laser replacement.

### 5-YEAR LASER WARRANTY.\*

It's the first and only one in the industry. And another great reason to add the SV40's superior transparency and realism to your home entertainment system now. Purchase before January 31, 1987 and get the Shure V15 Type IV-MR Cartridge **FREE**. For the name of your nearest dealer, call 1-800-257-4873. (In Illinois 1-800-624-8522)

Offer ends January 31, 1987.

Shure Brothers Inc., 222 Hartrey Avenue, Evanston, IL 60202-3696

\*See your dealer for details.

# SHURE®

MAKING THINGS THE WAY THEY *SHOULD* SOUND  
FOR OVER 60 YEARS.™

CIRCLE NO. 15 ON READER SERVICE CARD

models may have one or three. These are not questions that should influence your choice of a player.

But what about specifications? The audio specifications on all CD players are wonderful. Distortion has reached the vanishing point, the dynamic range is almost more than you want for home listening, and the frequency response is fantastic. There are measurable tiny differences in the frequency response of various players at the very highest frequencies, but they are simply not significant.

The notion that there are not enough differences in CD players' specs to influence a buying decision is very hard for long-time audiophiles to accept. They are accustomed to poring over spec sheets and lab-test measurements, and they are not comfortable with this change that the Compact Disc system is bringing into the equipment market. But for a lot of other people, who would like to own good equipment and enjoy the best sound but have never been comfortable with all those numbers, this change is liberating.

### Sound Quality

The most controversial aspect of the performance of Compact Disc players is the quality of sound they deliver. There are people—including some well-respected audio experts—who insist they can hear subtle, but significant, differences in the sonic performance of various CD players. They speak of differences in such things as "smoothness," "sweetness," and "musicality."

On the other hand, from the time CD players were first introduced the editors of this magazine have taken the position that the measurable differences are too small to take into account in choosing a player. Julian Hirsch, who has conducted all our individual and comparative tests of Compact Disc players, has repeatedly stated that the difference in sound quality from one player to the next is inaudible or insignificant.

We all agree that some very poorly recorded Compact Discs have been released (just as there have always been some analog LP's of poor technical quality), and that comparative sound quality is a basis for choosing software (CD's) but not for choosing hardware (CD players).

To verify the evidence of our own ears we decided to conduct blind listening tests of a range of CD players. Since our staff members had already taken a stand on the question, none of us were included in the listening panel. To eliminate any possible appearance of bias on

**T**he Magnavox FD1051 BK has three-speed audible search to help you find the track you want.



**R**ealistic's CD-1200, which can play sixteen tracks in any desired order, lists at only \$299.95.

our part we had the tests carried out by David L. Clark, of DLC Design in Ann Arbor, Michigan, far from Hirsch-Houck Laboratories and far from our New York offices. Ian Masters, a freelance writer, was commissioned to report on the results.

Published in our January issue, the results showed that using test signals in A/B comparisons under carefully controlled laboratory conditions, the listeners were able to hear minute differences just often enough to have statistical significance. When *music* was used in the comparisons instead of test tones, however, the panel could not hear any significant differences or indicate preferences for one machine over the others.

If all the players sound alike, you may well ask, why not just buy the cheapest one available? For the same reason that you don't buy the cheapest watch that will keep time accurately or the cheapest car that will transport you to work and back. In buying a watch or a car you are interested in features, styling, quality of construction, durability, ease of operation, and even pride of ownership. The same factors play a part in your choice of a CD player.

Among the changes brought about by new digital technology is the simplicity of operation of CD players. This appeals to large numbers of buyers who were daunted by the complexity of choosing and operating conventional hi-fi equipment. The sonic virtues of the Compact Disc system have made many jaded record collectors get excited about music all over again. They find themselves thrilled once more by the standard recorded repertoire as they rebuild their collections on Compact Discs.

Any way you look at it, the digital age of recording is too exciting for you to miss, and the important thing is for you to buy a CD player now. If you can only afford the cheapest one, buy that and hope you can trade up in a year or two.

And if a friend or a salesperson tries to demonstrate to you that one player sounds better than another, be sure that they are played at equal volume in the comparisons. Otherwise, the louder one will always sound better. If in such a comparison you should hear one that *does* sound "smoother," "sweeter," or more "musical" to you, my advice is to buy that player. It is the one that will make you happy. □

**ESM**  
ENERGY SYSTEM MONITOR

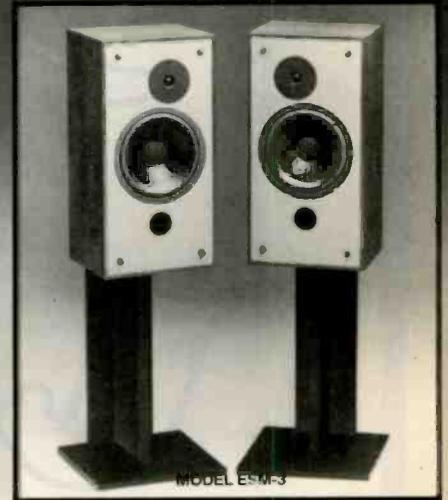
by  
**ENERGY**

If you aspire to owning the famous Energy 22 Pro Monitor but can't quite afford it, hear the ESM-2. With size and performance approaching the 22, it is "both a fine loudspeaker and an excellent value."

Or perhaps the more compact ESM-3 will better suit you - it is "definitely an excellent value."

On a student budget? Try the new ESM-4 bookshelf monitor - very affordable!

Audition any of the ESM monitors. We think you'll agree with what *Stereo Review*, *High Fidelity* and *Audio Ideas* say below.



ALL ESM MODELS COME IN MIRROR-IMAGED PAIRS AND ARE AVAILABLE IN EITHER WALNUT GRAIN OR BLACK ASH.

## "AMAZING AT THE PRICE"

"response varied only  $\pm 1.5$  dB from 180 to 18,000 Hz which is unquestionably one of the smoothest responses we have yet encountered from a speaker ... dispersion on a par with response flatness ... phase shift highly linear ... excellent peak power-handling ability ... only at 100 Hz did we manage to reach the speaker's (power handling) limits: with 990 watts (using single cycle bursts followed by 128 cycles of silence) ... smooth midrange and high frequency response, excellent dispersion and group delay, and exceptional short-term power-handling ability ... definitely an excellent value"

*Stereo Review* February 1986, on the ESM-3

"a fine loudspeaker and an excellent value ... very smooth and quite flat, falling within  $\pm 3\frac{1}{2}$  dB on-axis throughout the range above the 50 Hz band ... in the lab's 300 Hz pulse test the ESM-2 accepted without noticeable complaint the full output of the test amplifier ... (470 watts, peak into 8 ohms), for a calculated SPL (Sound Pressure Level) of 114  $\frac{3}{4}$  dB. Loud transients thus should be handled well ... bass sounds more extended than the response curves might suggest, with surprising heft at the very bottom ... Stereo imaging, too is very good ... Even if your budget can accommodate twice the ESM-2's price - you owe it to yourself to audition Energy's latest design."

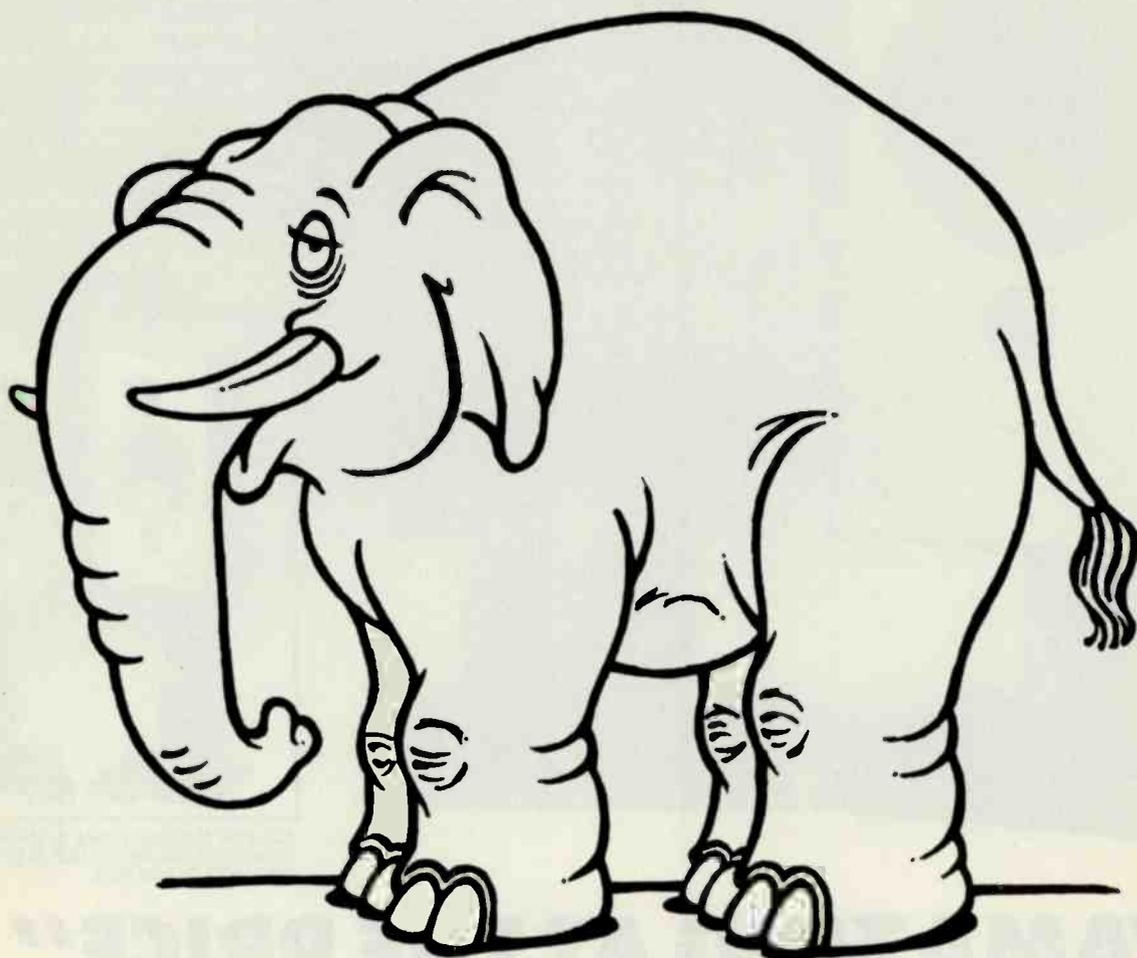
*High Fidelity* January 1986, on the ESM-2

"exceptional overtone balance ... imaging was just about the best I've heard ... excellent dynamic range ... it sounds great ... no real compromises in its design ... anyone looking for a \$1,500.00 to \$2,000.00 system would be foolish not to carefully audition the Energy ESM-2 ... amazing at the price."

**ESM**  
ENERGY SYSTEM MONITOR

by **ENERGY**

# He's good. But can he remember 785 of your favorite songs?



This Magnavox compact disc player can. In fact, the top-rated CDB650 is the *only* CD you can program to play 785 selections. As you build your library, just program in your favorite selections from each disc in any order you want. The CDB650 will never forget them. Because it's the only CD with

Favorite Track Selection. With FTS, the memory remains forever, even during power outages, even if it's unplugged. And it comes with full-function remote control.

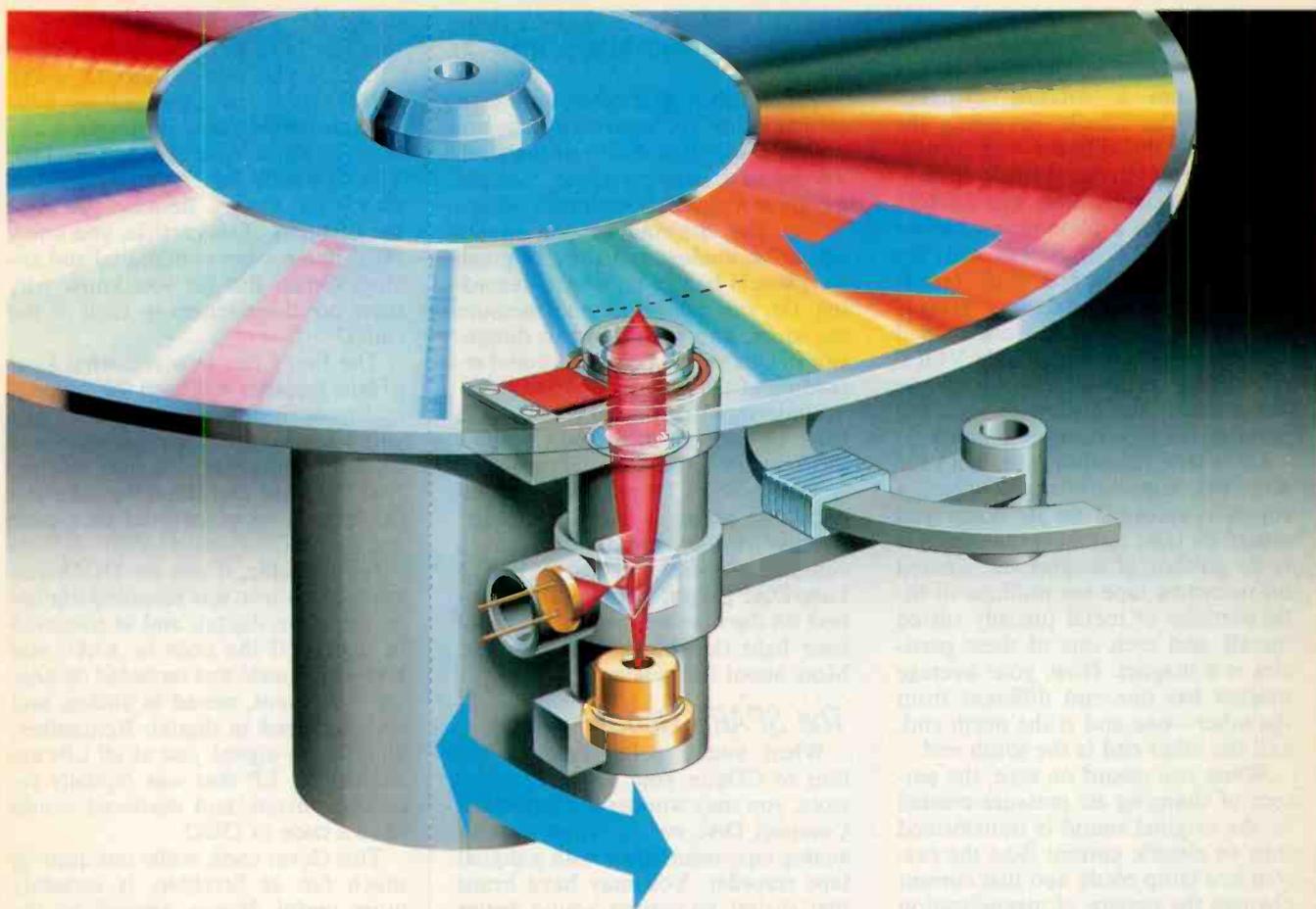
With 4 times over-sampling and digital filtering, all you hear is sound the experts rated "unequaled." What else would you expect from the people who invented CD technology?

The CDB650. Unforgettable.



*Flawless sound. The ultimate memory.*

**Nobody puts it together like MAGNAVOX.**



# CD BASICS: DIGITAL AUDIO THEORY AND PRACTICE

A simple explanation of what goes on inside a CD player.

**C**ompact Discs are incredible. They've got all these digital numbers on them, the players bounce a laser beam off the disc to read the music, any errors are corrected, and it all sounds wonderful. That's a bit of an oversimplification, but the basics of digital audio are not beyond the comprehension of most people. It involves sound, digital recording, and the Compact Disc standards, plus some background on how CD players work.

Sound is changing air pressure. When the pressure of the air changes

by William Burton

quickly—from about twenty times per second to about twenty thousand times per second—we hear that changing air pressure as sound. Vibrations slower (lower in pitch) than about twenty times per second cannot be heard, but, if they are loud enough, can be felt. Vibrations faster (higher in pitch) than about twenty thousand times a second cannot be heard by human beings, but can be heard by animals such as dogs.

What does all this have to do with

CDs? Well, Compact Discs are recordings of sound. They are a special kind of sound recording, which we call *digital*. The more common kind of sound recording, used on standard long-playing phonograph records, ordinary cassette tape, and on videotape, is *analog* recording.

An analog recording is a physical record of the changing air pressure that sound is. On an LP, the wiggles of the groove correspond to the changing air pressure of the original

*Illustration courtesy of North American Philips.*

sound. The first sound recordings were made by speaking into a horn connected to a needle that carved wiggles into a rotating cylinder. When another needle was put in the wiggle and the cylinder was turned, the needle wiggled and made sound.

If the original sound was **LOUD**, the groove on a phonograph record wiggles **A LOT**. If it was *soft*, the groove wiggles just a *little bit*. If the original sound was **HIGH PITCHED**, like a tweet from a small bird, then the grooves wiggle **VERY QUICKLY**. If the original sound was **low pitched**, like a growl from a big bulldog, the grooves wiggle **slowly**.

On a tape recording, you can't see how the tape is changed when a sound is recorded on it. When you record on tape, the thing that changes is its pattern of magnetism. Coated on recording tape are millions of little particles of metal (usually rusted metal), and each one of these particles is a magnet. Now, your average magnet has one end different from the other—one end is the north end, and the other end is the south end.

When you record on tape, the pattern of changing air pressure created by the original sound is transformed into an electric current (like the current in a lamp cord), and that current changes the pattern of magnetization on a tape. For example, to oversimplify, a lot of little magnetic particles, all with the same end magnetized the same way, might represent a loud noise. This changing pattern on the tape is like the changing pattern of the original sound.

Because the magnetic pattern on the tape, or the shape of the groove, is *analogous* (similar) to the original sound, this kind of recording is called *analog* recording.

In a *digital* recording, which is done first on tape before being transferred to a Compact Disc, the pattern on the tape isn't anything like the original sound. There *is* a magnetic pattern on the tape, as on an analog tape recording, but a lot of little magnets all with north pointing the same way does not mean a loud noise. The pattern on a digitally recorded tape does not have any direct relationship to the original sound. On a CD, there are no big wiggles, small wiggles, slow wiggles, fast wiggles, or any kind of wiggles at all.

What *is* on a digital tape and on all CDs are numbers, or *digits*. A digital recording is called digital because it has digits on it. The numbers that are usually recorded on a digital tape are not our standard numbers, such as 4, 9, 8, or 2, but are either 0 or 1. In oth-

er words, they are not decimal (base 10) numbers, but binary (base 2) numbers.

The numbers that make up a digital recording are *measurements*, not *representations*, of the original sound. To use an analogy, one way to make a copy of a square is to draw a picture of it. The drawing of the square would be analogous to the original, so it would be like an *analog* recording. Or, instead, you could measure the square and write down its dimensions. This would be like a *digital* recording of the square.

Understanding digital recording is basic to understanding the Compact Disc system because digital recording is what makes CDs possible. A Compact Disc player is like a computer, because it uses binary digits as a computer does, and it is like a LaserDisc player, because the numbers on the disc are read by beams of laser light that bounce off the disc. More about lasers later.

### *The SPARS Code*

When you're going through the bins of CDs in your favorite record store, you may wonder if a particular Compact Disc was recorded with an analog tape recorder or with a digital tape recorder. You may have heard that digital recordings sound better than analog recordings, with less noise and less distortion. You may also have heard that digital recordings can sound worse than analog recordings, being harsh, edgy, and metallic. Both of these generalizations can be true: digital recordings do tend to be quiet and clean, and some of them, especially those made from lousy master tapes, do sound harsh.

You may also wonder what kind of tape recorders were used when the original recordings were mixed, edited, equalized, processed, compressed, limited, and put through a meat grinder at the recording studio. Nobody knows all the magic secrets of the recording engineers, and while most of it is white magic that can make a hopeless incompetent sound like a talented musician or a untuned, unrehearsed garage band sound as tight as Genesis, some of those spells and charms are black magic that results in awful-sounding records.

Because all Compact Discs are digital, at least you know that what you have in your hand is digital. All LPs are analog, all cassettes are analog, so you don't have to worry about them. Actually, most people who buy Compact Disc players only worry about LPs and cassettes because they want

to get rid of the ones they have so they can have more room for CDs.

OK, so you look at this CD you've got. If you're lucky, you will see a little code on the back. It may look like this: DDD, DAD, AAD, or ADD. The *D* stands for *Digital* and the *A* stands for *Analog*. Because you read the first part of this article, you know the difference between digital and analog. Great. But do you know why there are three letters in each of the codes?

The first letter tells you what kind of tape recorder was used for the original recording. The second letter tells you what kind of tape recorder was used for the processing and mixing. And the third and last letter tells you the type of recorder used to master the music.

For example, if you see DDD, you know the music was recorded digitally, mixed in digital, and is mastered in digital. If the code is AAD, you know the music was recorded on analog equipment, mixed in analog, and was mastered in digital. Remember, all CDs are digital, just as all LPs are analog. An LP that was digitally recorded, mixed, and mastered would have a code of DDD.

This clever code, while not quite as much fun as Scrabble, is certainly more useful. It was devised by the Society of Professional Audio Recording Studios, or SPARS, and the three-letter code is known as the SPARS code. PolyGram, a division of the Philips company that developed the Compact Disc format, uses a seemingly identical code on some of their CDs, but they say they came up with their code independently. (The Compact Disc format is known as the Sony/Philips CD format because Sony added their digital error-correction technology to Philips' laser-optic technology.)

After all that, you might think that the SPARS code is important. It is. But a DDD can also mean Distorted, Dumb, and Dreadful, if the digital recording is poorly done, the digital editing is stupidly done, and the digital mastering is dog-gone disappointing. A disc that is labeled AAD might be Artistic, Accurate, and Delightful.

The SPARS code is one clue about the history of the recording that you are considering buying. Unfortunately, very few record companies give you any other kind of clue. Wouldn't it be wonderful if a record company told you on the outside of the record what the music was like? They might say, "The music on this record is kind of like music by the Beach Boys,

but the songs are all about gorillas. The instruments played on the record are guitar, piano, bass guitar, and drums, and there is a lot of singing." This kind of description takes up more space on the record than the SPARS code, but if you would like to hear the Beach Boys sing about gorillas, you'd sure buy the record, wouldn't you?

### The CD Standards

It is basic to the Compact Disc standard that sound is recorded on the disc in binary numbers that are measurements of the original sound. But how often do you measure the original sound? How many numbers can you choose from to represent the changing volume levels?

Let's try another analogy. Since digital recording of sound is measuring changing air pressure, let's slow down the process a bit.

Meet Atoo D. Converter. Atoo is a weather nut. He doesn't care about the temperature, rain, snow, sleet, clouds, or any of that. All Atoo cares about is atmospheric pressure—air pressure.

He measures air pressure with a barometer. Being the diligent kind of guy he is, after he measures the air pressure, he writes it down. So, just for fun, let's say he measures the atmospheric pressure once a day, at twelve o'clock high. Every day about noon, Atoo steps out to his sunporch, looks at his barometer, and writes down the number that the barometer indicates.

Now, because Atoo has only one number for each day, he has no record of the changes in air pressure that happen between one measurement at noon and the next measurement at noon the following day. Because he measures, or samples, the air pressure once a day, we can say his *sampling rate* is daily.

Atoo's barometer is an old one, a Brickner model that he got from an old shipwrecked submarine. While the face of an analog clock has twelve numbers on its dial, his classic Brickner barometer has 100 numbers on it. So, every day, he writes down a number between zero and 100, reading the number off his barometer. We can say that the quantity of numbers he has to work with, or his *resolution of quantization*, is 100.

So let's take a look at Atoo's records for a week. Sunday: 45. Monday: 51. Tuesday: 54. Wednesday: 62. Thursday: 65. Friday: 61. Saturday: 73. Atoo wasn't very happy with records like that. He felt they weren't accurate enough. What if the atmo-

spheric pressure went up like crazy on Sunday afternoon, but then went back down Sunday night, so by the time he measured it at noon on Monday, he recorded a change of only 6 points instead of the real change of 30, or 40, or whatever?

Atoo decided he would have to start measuring more often. First, he decided to measure every hour—24 hours every day. This way, his records would be much more accurate. *He increased his sampling rate to twenty-four times a day.*

Atoo also decided that 100 numbers were not enough. When he measured the air pressure at 50, what if it were really 50.43 or 49.78? A hundred numbers were not enough for the accuracy that Atoo wanted. So he bought a more accurate barometer calibrated to hundredths of a microbar. Then he could put down 50.43 or 49.78. His numbers would be more accurate because he had more of them. *He had increased the resolution of his quantization.*

Still, this was not accurate enough. Atoo wanted to measure more accurately, so he had to measure more often and have more numbers available for recording his measurements. And, he decided, he wanted *two* barometers, so he could measure the air pressure at the left side of his house and at the right side of his house.

If Atoo measured the changing air pressure at the left 44,100 times each second, and the changing air pressure at the right side 44,100 times each second, and had a range of numbers from zero to 65,535 for his measurements, he would be recording the changing air pressure just as frequently and with the same accuracy (the same resolution of quantization) as a digital-to-analog converter changes an analog signal (the original sound) into a digital recording of that sound that can be encoded onto a Compact Disc.

Each second of sound on a Compact Disc is represented by 44,100 measurements for each channel: 44,100 for the left channel, and 44,100 for the right channel, for a total of 88,200 measurements. Each *one* of these measurements can be anything from zero to 65,535.

If our weatherman Atoo D. Converter measured that accurately, he would be as accurate as an A-to-D converter making a digital audio recording for a Compact Disc. Recording at that rate means that soundwaves of about 20,000 Hz or less can be accurately represented, because each wave can be sampled at least twice. Any frequencies between

samples that are not measured, and therefore not recorded, will be higher than half the sampling rate. This is the Nyquist theorem, and it is basic to the practice of digital audio.

The sampling rate is expressed in the number of samples per second. Since the term *cycles per second* has been shortened to the word Hertz, in honor of the brilliant German scientist, a system that samples 44,100 times each second is said to have a sampling rate of 44,100 Hertz, or, even shorter, using a *k* to mean thousands and abbreviating Hertz's name, 44.1 kHz.

The resolution, or accuracy, of the quantization is expressed in a somewhat more complex form. When Atoo traded in his old Brickner barometer for the new Supremo Gizmo model, he gained accuracy because he had two more decimal places that could indicate smaller changes in air pressure. Adding more places to the numbers that are recorded on CDs also makes the measurements more accurate.

In binary, having two places means that your lowest number will be zero and your highest number will be three, which in binary is 11 (the 1 on the left means a two, and the one on the right means a one, and two + one = three). If you have three places, the highest binary number you can have is 111, which is seven (four + two + one). If you have sixteen places, the highest number you can have is 1111111111111111, which is 65,535. A one or a zero is called a *bit*, so the Compact Disc standard for quantization—the resolution of its quantization—is 16 bit.

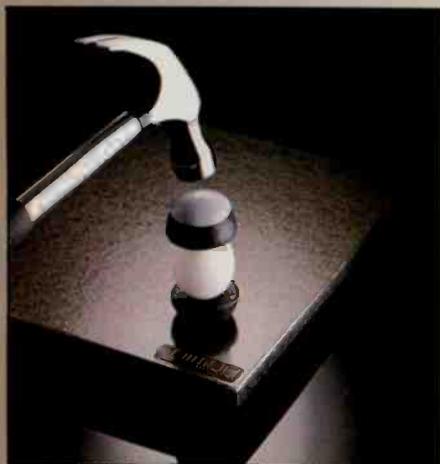
These numbers are encoded on a disc as flat areas and pits. When the master disc is made, a pulsating laser zaps the master disc, making a pit where the laser beams hits it, bulging out the other side of the master disc to make a bump. When a real CD is made from this master, the side with the flats and the bumps is the side that the laser bounces off. You might think that a flat is a zero and a bump is a one, but, actually, the beginning or end of a bump are ones, and the bumps and flats are zeros.

How many of these numbers, in the forms of pits (or bumps, depending on how you look at it), can fit on a CD? About five billion, give or take a few. More to the point, how many minutes of music can fit on one CD? When Philips and Sony were developing the CD, there were different ideas on how large to make the disc. In fact, the experimental Compact Discs played from the inside out (the

# THE COMPACT DISC

In the design of electroacoustics systems the control and damping of vibration and resonances is of fundamental importance. Such problems cause significant distortions and detract from accurate information retrieval.

The Isoplat was developed by Mission to isolate high-fidelity and other precision equipment from extraneous mechanical interference. The success of Mission's Isoplat is well known and the results are clearly audible if used, for example, with a CD player.



THE ISOPLAT

The Isoplat is manufactured from sandwiched fibre board utilizing critically designed feet made from Sorbothane. Sorbothane is a unique polyurethane elastomer simulating the intriguing energy-absorbing properties of human flesh. The polymer is a quasi-liquid molecular spring and exhibits both the dimensional stability of solids and many hydraulic characteristics of fluids. Its hysteresis pattern is also unique, such that distortion and recovery can be independently controlled. Sorbothane has remarkable memory – permanent deformation under normal loads is virtually zero. The ability of this new polymer to absorb up to 95% of impact energy, combined with low compression set, flexibility, recovery rate, absorption of energy with low peak forces, and excellent kinetic energy absorption properties make this patented material totally unique. To dramatise the properties of Sorbothane, it can be demonstrated that an egg sandwiched in a Sorbothane mould and hammered with a mighty blow will not break, or that a submarine lined with sorbothane would not be detected by sonar, in that it would become acoustically invisible. Mission have the world exclusive rights to Sorbothane in electroacoustic applications.

Pulse Code Modulation is the 21<sup>st</sup> century technology for the storage and reproduction of music. Optical laser systems are an equally sophisticated partner for such a technology. The combination has produced Compact Disc. CD's staggering dynamic range, channel separation, low distortion, exact speed stability, zero disc wear, random access, programmability etc., put this medium in the forefront of audio technology. As with all new technologies the early implementations proved problematic, and the fact that the industry was dominated by the mass-market manufacturers, with minimal commitment to music, delayed acceptance of the medium by the discerning music lover. However, Mission's first CD player provided the stimulus for many to take the medium seriously and made the DAD7000 an instant international success.

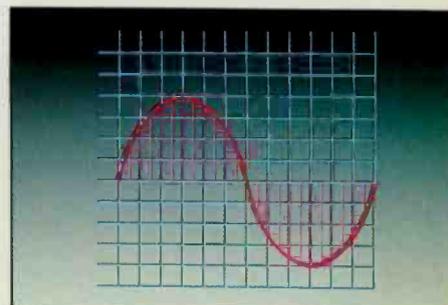
On the eve of the introduction of the DAD7000 an intensive and radical programme of research had started on advanced new generation Mission players code-named PCM4000 and PCM7000 – the company's definitive statement in Compact Disc technology. The unique combination of the following design features, seldom if ever found in competing equipment, underlines the sheer technical sophistication of Mission's new CD players. However, no amount of technical explanation can fully convey the breathtaking realism with which the MISSION PCM reproduce the emotional dynamics of music.

## DIGITAL TO ANALOGUE CONVERSION

The digital to analogue converter (DAC) is the most significant component in the compact disc replay system. Certain design flaws in this unit can cause serious degradation of the sound quality, while others may merely degrade the quality marginally. The linearity of the DAC is naturally one of the important parameters of the unit and often quoted in

manufacturers' specifications. However, there are certain types of non-linearities with serious audible effects, regardless of their magnitude. These usually manifest themselves in the form of compression and serious loss of linearity in low level signals.

Other problems can arise from poor power supply rejection of the DAC; this can be very serious and can cause loss of clarity and poor high frequency behaviour of the audio output. A further common flaw is susceptibility to dynamic distortion caused by poor high frequency behaviour of the DAC normally due to dynamic



Typical output of digital to analogue converter to a sinusoidal signal.

mismatch of the conversion elements. The output sample-and-hold of the DAC also plays an important part in reconstruction of the audio signal. Typically, a poor design can cause a complex form of distortion consisting of anharmonics which can be audibly objectionable.

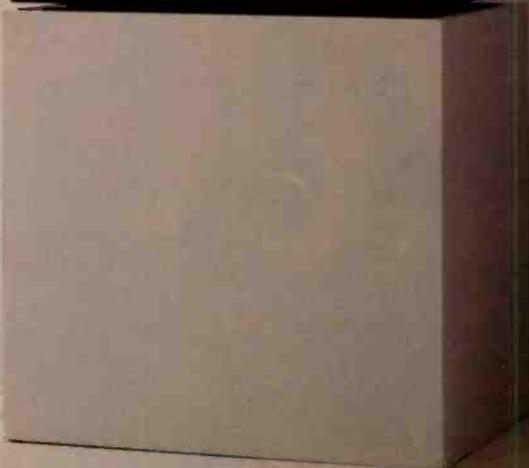
The DAD7000 had already successfully addressed the above problems, at only 14 bit resolution. The major area in which scope remained for improvement in the DAC was the loss of information inherent in the 14 bit chip, which could only be restored through the use of an equally optimised 16 bit chip, operating at the same high speed of 176.4 KHz. The MISSION PCM, through its pioneering use of the long awaited true 16 bit, 4X



oversampling twin DAC/single chip technology, surpasses by a wide margin even the highly acclaimed DAD7000. This chip marks a new epoch in compact disc technology, giving a true 16 bit resolution at 176.4 KHz sampling rate. Its superb linear performance ensures the highest possible fidelity, while the single chip 'Very Large Scale Integration' makes for perfect inter-channel thermal stability.

**Features:**

- 4x Oversampling, full 16 bit.
- Twin DACs, VLSI technology.
- Four separate DC power supplies.
- Full function interactive FTD.
- Random order 20 track/index programming.
- Single laser pickup system.
- Super fast track/index access time.
- Program review - add/correct facility.
- Three speed search - 10 dB attenuation.
- Cueing to within 1 second.
- Electronically generated display of:  
Track/Index numbers;  
Elapsed/Remaining/Total time;  
Play, Pause, FFW and REW;  
Repeat, Store; Track/Disc errors etc.
- Motorised loading, anti-jamming protection.
- Output headphone jack.
- Standard format digital output.
- Two outputs - fixed and variable. (7000).
- 11 function IR remote control. (7000).
- Remote Electronic Volume control. (7000).
- Four regulated DC power supplies (7000)
- Special non-magnetic output connectors (7000)
- Pre-selected ultra high resolution DACs (7000).





PERE

# GETTING READY FOR DIGITAL

If you have recently bought a Compact Disc (CD) player, or are planning to buy one, you may be wondering what (if any) changes should be made elsewhere in your system. From all that has been said and written about the "digital readiness" of various audio components (principally amplifiers and speakers), it would be easy to conclude that adding a digital program source to a plain "garden variety" music system is likely to unlock a Pandora's box of problems, ranging in severity from unsatisfactory sound quality to possible destruction of an amplifier.

Fortunately, none of the above is likely to result from simply adding a CD player to an existing system of reasonable quality. Its output is fundamentally no different from that of any other common signal source, such as a tape deck, LP record, or FM tuner. The most significant characteristic of a digital program is a complete absence of the usual aberrations associated with analog sound recordings—principally flutter, rumble, hiss, and the like. You are not likely to be too offended by their absence in a CD.

## *Digital Characteristics*

We have all experienced the harsh sounds caused by a mistracking phono cartridge as it attempts (unsuccessfully) to follow an LP record groove through a high-level passage. This effect is totally absent from CDs, whose maximum recorded levels can never exceed the capabilities of the player. The phono preamplifier portion of your amplifier is not used for playing CDs, eliminating a major source of hum and hiss, and the CD player's maximum output of about 2 volts cannot overload the input stage of any amplifier. Acoustic feedback (the howling sound that

*Compact Discs sound  
so true to life that you  
may want to upgrade  
the rest of your stereo  
system.*

*by Julian Hirsch*

sometimes occurs at high volume levels when the turntable and speakers are too close to each other) is virtually impossible to create with CDs.

Does this mean that the CD is a perfect medium for recorded music? Probably even its most enthusiastic supporters would not make that claim. However, although it may fall short of perfection in several respects, it is by far the best music playback medium ever developed for home use. Many of the criticisms leveled against the CD arise, not from the medium, but from the message it carries. An undistinguished Compact Disc recording, by virtue of its microphoning techniques, the making of the master tape or the subsequent mixdowns, the hall acoustics, or even the musical performance itself, will be every bit as unsatisfying as its counterpart on an LP record. Worse, in fact, since the CD is merciless in revealing every deficiency in the program. Also, a number of CDs have been made from analog master tapes (if you can hear any hiss from the recording, even at high volume levels, you can be sure that its origin was an analog master tape). Some

may even contain audible distortion, which also arises from the original recording. Such a CD will sound only marginally (if at all) better than its analog equivalent. It may be free of wow, flutter, rumble, clicks and pops, and many forms of nonlinear distortion that are common to analog recording, yet fail to produce the full quality possible with a CD.

## *Digital vs. Analog*

Although your present system will almost certainly function properly with a CD player, and provide greatly improved sound quality, it is quite possible that upgrading some or all parts of the system will yield rich sonic rewards. While the audio derived from a digital recording may sound basically very much like the programs you have been listening to, there are some differences (not necessarily obvious). LP records typically have a dynamic range of 60 dB or so (some have much less than that, while a few high quality audiophile releases may reach 70 dB). In this context, dynamic range is defined as the difference between the maximum and minimum recorded program levels (other definitions are sometimes used). The maximum level that can be recorded on an LP is limited by the design of the cutting head that creates its modulated groove. Modern cutting heads can record a higher groove velocity than can be tracked by almost any existing cartridge. Usually, the maximum level is restricted when the recording is made, so that it can be played by typical pickup cartridges. The minimum level is determined by the system noise level, a combination of hum, hiss, rumble, and the effects of vinyl imperfections. Normally the minimum recorded signal is set appreciably higher than the residual noise level,

which prevents the full 70+ dB range of a vinyl record from being realized in practice.

A CD also has a maximum level, the "zero level" to which the noise and distortion of a CD player are referenced. Unlike analog records, the distortion of digital playback does not vary significantly from the maximum level to extremely low levels. You may have read criticisms of CDs, based on the fact that the playback distortion increases somewhat as the program level drops. Although this is true, you should keep in mind that the HIGHEST distortion that will ever exist in a CD playback is far lower than the LOWEST value in an analog record system. Nonlinear distortion (harmonic and intermodulation) in the CD system is entirely negligible and far below the threshold of audibility. Since the CD has no background noise, you may be tempted to play it at a higher volume level than you would use for LPs. To a point, this is good, and in fact it is one of the real advantages of the CD over the LP. It must not be carried to excess, however. You will never be able to hear the noise floor, but high peak levels could eventually damage your speakers or amplifier.

Most analog recordings are compressed (loud passages are recorded at a reduced level and soft passages are boosted) so that when the soft passages are played loudly enough to mask the background noise, the peak levels remain within the maximum level capabilities of the record, the pickup, the amplifier, and the speakers. The better digital recordings have little or no compression, which allows the natural program dynamics to be preserved. This is one of the reasons for the striking clarity and "you are there" quality of a good digital recording. If you listen to the program peaks at the same level you would use for analog programs, the lack of signal compression or limiting in the program may make the average CD volume seem lower than you are accustomed to, and the softest passages may be masked by the room ambient noise level. The usual solution to this problem is to turn up the volume a bit.

This is why it is desirable (though not strictly necessary) to have more peak power available for playing CDs than would be needed for LPs. How much more you will need is a function of your listening habits, the listening room, and the speakers. It is impossible to give any blanket recommendations for specific amplifier power ratings or speaker sensitivities,

other than the rather simplistic advice that you can never have too much power! This happens to be close to the truth, by the way, and when in doubt it is always good to have more power than you need, rather than less. A few fairly concrete suggestions are possible, however. If you now have a low-cost system, with amplifier ratings of less than 20 watts per channel, and the small speakers normally used with such a system, you should plan to replace both. You can play (and enjoy) a CD on almost anything, including lightweight headphones, but you are missing the essence of its unique quality if your audio system is less than the best.

### Speakers

Since the goal of speaker and amplifier upgrading is the ability to generate a higher undistorted sound pressure level at the listening position, the speaker sensitivity must be considered in relationship to the amplifier power. If a speaker with a 90-dB sensitivity will deliver satisfactory performance with a 50-watt amplifier, a speaker rated at 100 watts for the same acoustic output level, and an 84-dB-rated speaker (a relatively low, but not unheard-of sensitivity) will require 200 watts! Most speaker manufacturers publish sensitivity ratings, and the test reports in *Stereo Review* always include our own measurement of speaker sensitivity (usually quite close to the manufacturer's rating).

Unless you are completely satisfied that your present speakers meet your personal standards for sound quality, you are probably best advised to upgrade the speaker portion of the system first. Initially, you can go about this as though there were no such thing as digital audio—simply look (and listen) for the best and most pleasing sound that will fit your budget. All the qualities that make a speaker desirable for any hi-fi system will contribute equally well to its digital readiness. Smooth, well-dispersed sound, low distortion, good imaging—whatever you look for in a speaker should be present in your new selection. Don't worry too much about its sensitivity, which has nothing to do with its sound quality. If the speaker you prefer has a low sensitivity (can't play very loud with your present amplifier) you may need a more powerful amplifier, but power is relatively inexpensive these days.

One speaker attribute that has a direct bearing on its "digital readiness" is its peak power handling ability. Be-

cause of the short duration of most high-level program peaks, they are unlikely to cause damage, but every speaker has a finite limit to the sound pressure level it can deliver at various frequencies. This is rarely the subject of a published specification, and can be inferred only approximately from the manufacturer's power ratings. A rating such as "recommended for use with amplifiers delivering between 20 and 200 watts" is of little value, other than to tell you that a 200 watt amplifier is not likely to damage the speaker in normal use (even with digital program material). However, two speakers with the same maximum power rating may not be equal in their suitability for digital playback. Their maximum undistorted acoustic outputs may be quite different, and an overdriven speaker, even if it does not distort audibly, will lack the full impact of one that does not limit the program peaks.

Sometimes a speaker is rated to be able to deliver a certain maximum sound pressure level (SPL). This is often given for a pair of speakers (whose maximum SPL is 3 dB greater than that of a single unit). However, if one speaker is rated to produce a 105 dB SPL in a typical room, and another carries a 115 dB rating, the second is clearly better suited for handling the high level peaks of a digital recording. Whether or not you will ever drive either speaker to its limits (or even have the amplifier power that this would require) is not too important; the one with the higher rating is less likely to limit your system performance. You should be aware, however, that this factor has nothing to do with the other sonic qualities of a speaker. It will do you no good to have a speaker system that can handle digital program dynamics if its sound does not please you. Given the choice, the reverse priority would be preferable, since there is no inherent need to drive your system to its limits, while it IS important that you find its sound pleasing.

The speaker test reports in *Stereo Review* include information on how much peak power they can handle at low, middle, and high frequencies without distortion or compression. These numbers do not correspond directly to the acoustic SPL, but you can draw some inferences from the sensitivity and peak power measurements, when comparing speakers tested by Hirsch-Houck Labs. For example, if two speakers can each accept 500 watts input at 1,000 Hz, but

one has a 6-dB higher sensitivity, the latter can deliver up to 6-dB more acoustic output at that frequency without distortion or compression. This is not a valid reason, in itself, for preferring one speaker over another, but it should be taken into consideration.

### Power

This is a good time to emphasize that "more power" does NOT mean "louder," any more than more horsepower in your car engine means that it goes faster than one with less power. When you are driving at 40 or 50 miles per hour, the horsepower of your car doesn't matter at all. A more powerful engine merely gives you more acceleration when necessary. In your stereo system, your average listening level probably does not demand more than one watt (if that much) from your amplifier. A 10 watt amplifier and a 100 watt amplifier will produce the same listening level under identical conditions. However, the high peak levels available from a CD may sometimes require an increase to 100 watts (20 dB) for a brief fraction of a second, and

ordinary compressed LPs may drive the amplifier to transient outputs of 10 watts (these numbers are illustrative, but are not too far from typical "real world" conditions). When playing LPs under these conditions, you may not hear any difference between 10-watt and 100-watt amplifiers, since both are capable of handling the maximum signal levels they will encounter. But with a CD supplying the program, a 10-watt amplifier will clip severely on peaks, which may impart a harsh quality to the sound, or perhaps merely dilute the impact of a sudden transient, whereas a 100-watt amplifier will pass the full dynamic range of the program to the speakers.

Most of the time, any amplifier reproducing music is operating at a small fraction of its full power capability. Almost never is the full power required for more than a fraction of a second. There are exceptions to this rule, but fortunately they are rare, since most amplifiers and speakers are not designed to withstand sustained high power operation. A good indicator (in addition to its continuous power rating) of the suitability of an amplifier for use in a CD system is

**DYNAMIC HEADROOM.** This is a measure of how much more than its rated output the amplifier can deliver for a short burst of 20 milliseconds repeated twice per second. Although most amplifiers have only about 1 dB or so of dynamic headroom, there are quite a number with a 3-dB rating, which means that they can deliver twice their rated output for this short interval. A few boast of headroom ratings of 6 dB or even more (4 times their rated output).

An amplifier with a high dynamic headroom rating offers the least expensive and most practical solution to the CD's need for high-level transient output. If you can afford it, this can also be achieved with an amplifier having a high continuous power rating. Most of the time, a 100-watt amplifier that can deliver 200 watts for 20 milliseconds plays just as loud (and sounds just as good) as one that can deliver 200 watts continuously. However, it is likely to cost a fraction of the price of the higher powered unit. It is also less likely to damage your speakers if you play your system with more enthusiasm than wisdom! □

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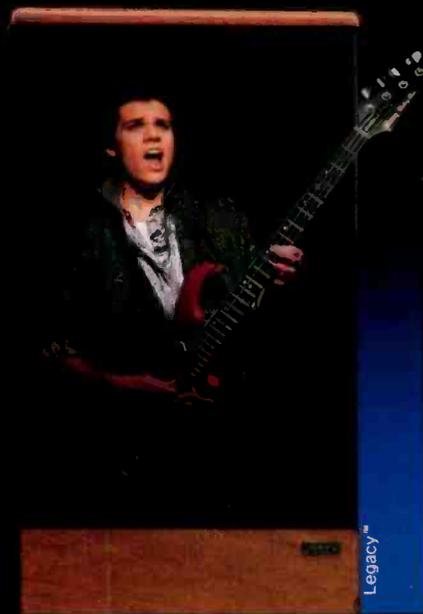
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CIRCLE NO. 44 ON READER SERVICE CARD

# HIGH-END COMPACT DISC PLAYERS

by Daniel Sweeney

For serious listening, consider some serious Compact Disc players.

**B**y some peculiar coincidence, my local audio salon is located directly adjacent to the health food store I frequent. And by some even odder coincidence, both vendors have recently provided me with some rather similar shopping experiences.

The health food store, once stocked primarily with seaweed shampoo and component vitamins, now boasts an enormous pharmacopaea composed of such exotica as valine, inosine, lipotropids, bee propolis, superoxide dismutase, and lemon bioflavonids—building blocks of the superman I'd like to be. But when I scrutinize the bottles and try to determine the benefits each pill will bring, the labels invariably declare, "no special claims are made for this product." Queries to the sales staff are even less enlightening, and I am met with mumbled replies about "free radical scavengers" and "oxy busters."

Next door at the audio den, it's much the same. There they're selling perfect sound in many guises—no less than twenty-three models of Compact Disc player. Instead of mysterious capsules, I ponder mysterious

microchips embodying such arcane circuits as time lenses, over-easy compressors, variable postemphasis, true 16-bit four-times oversampling D/A converters, discrete buffer amps, and so on.

The salespeople, when asked to explain these circuits, are vague. Not so vague as "no special benefits are claimed," but vague: "more air on the top end, better depth, greater resolution, less time smear"; that sort of thing.

If the audio babble were only coming from a few salespeople in a few high-end shops, one might be inclined to dismiss the whole concept of the sonically superior CD player, but precisely the same sort of statements appear in the ad copy of fairly mainstream companies such as Sony, Carver, Kyocera, and Denon. Manufacturers who were formerly unconditionally supportive of digital audio in general are now disparaging conventional players and urging the consumer to select a fourth-generation machine on the basis of this or that circuit refinement.

And more curious still, the small esoteric wing of the audio industry, once solidly critical of digital audio,

is now offering numerous CD players to the public, often low-end Philips players with a few "mods" in the analog circuitry. Suddenly everybody is stressing sonic differences where before the emphasis was on the general benefits (or lack thereof) of the format itself irrespective of the make or model of individual players.

## *Nuts and Bolts*

Now if significant sonic differences do in fact exist among players, they must arise from actual physical differences. The mechanical systems and circuit parts and topologies must be different, and they must perform differently or the claims of sonic differences are nonsense.

So how do the high-end players differ in design and construction from the mass-market variety?

In most cases, the differences are seemingly trivial.

All high-end and esoteric players contain a very high proportion of parts found in mass-market players. Rip open a \$1,000 player, and you're likely to find the same optics, transport, EFM decoder, demultiplexer, error-correction circuit, and D/A converter that you find in a \$300 ma-



AKIO

chine. In fact, you may find the majority of parts are common to mid-line machines.

Among high-end players, especially those emanating from small esoteric manufacturers, you tend to pay a great deal of money for a relatively small number of refinements. Whatever the idiosyncrasies of a Linn Sondek turntable, no one can say that it shares many parts with a \$300 Japanese direct drive, but one can point to renowned high end CD players by such manufacturers as Meridian, PS Audio, Kinergetics, Distech, and California Audio Technology, and one can clearly see a low-priced Philips deck beneath the faceplate. Some parts have been substituted, but much of the original machine remains. In audio slang, the deck is a "hot rod."

Why don't the high enders make Maseratis instead of hot rods, designing their own players from the ground up? Simply because most of them don't have much choice in the matter. Whereas most high-end electronic components, such as amps, preamps, and tuners, utilize discrete components hardwired together hobbyist fashion, there's no practical way to assemble the digital circuits used in CD players out of individual caps, chokes, transistors, and resistors. The circuit elements must be crammed into ICs, and the only source of such ICs is the handful of prime manufacturers such as Sony, Philips, Hitachi, Nippon Electric, and Matsushita (parent company of Technics, Panasonic, JVC, National, etc.). It is possible to design and order custom ICs from companies such as Signetics and American Semiconductor, but that gets expensive, and only a few high-end players utilize such custom chips.

The optics are even more difficult to make independently, and so far no high-end deck has ever used anything but stock optical parts, despite the fact that the tracking system is probably the weakest link in the whole playback chain. Even the highly vertically integrated Studer-Revox company, with its huge investment in machine tooling and its legions of skilled machinists, has not seen fit to develop proprietary CD optics.

Completely custom transports could be constructed more easily, but so far no manufacturer has attempted to do so. High-end players often have a few parts substitutions in the transport, such as metal castings or fine ceramics in place of sheet metal or plastic, but except for Nakamichi, no one is offering an innovative motor

design in the high end.

So where do high-end players actually differ from their humbler mass market brethren, and, more important, *why* do they differ?

The biggest differences between high-end and mass-market players occur in four areas: the analog filters, the power supplies, the analog output sections, and the acoustic isolation (if any) of the machines.

### Filters

All CD players, without exception, utilize some form of output filter to remove the high-frequency spikes created by the D/A converter and the other digital circuits in the machine. These ultrasonic spikes are not directly audible, but they do pose a problem for audio-frequency amplifier circuits, most of which are just not designed to pass them.

Typically, the output filters used in Compact Disc players are of the Chebyshev or Bessel type, with a multitude of capacitors, inductors, and resistors in various series and parallel configurations. Initially, in most of the first-generation players, such filters were designed without regard to phase coherence, producing literally hundreds of degrees of phase shift in the top octave, which in turn gave rise to group delay, or envelope distortion.

Since digital recording first surfaced commercially about a decade ago, an ocean of ink has been spilt in aimless controversies about group delay, and because such controversies still animate high-end designers, the term deserves a word of explanation.

Group delay is a variable time delay from one frequency or group of frequencies to another occasioned by almost all analog electrical filters. Analog filters, excepting the noble 6-dB-per-octave first-order Butterworth, produce phase shift in the frequencies on either side of the filter's center frequency or corner frequency, and these phase shifts themselves produce variable time delays among the frequencies subjected to the phase shifts. The time delays are functions of both the degrees of phase shift (which vary according to the slope of the filter and the distance of the frequency in question from the center frequency) and to the absolute frequency subjected to the shift. For instance, a 20 Hz tone, phase shifted 360 degrees (one wave cycle) in relation to a 40 Hz tone an octave up, will be delayed 1/20 of a second or 5 milliseconds in relation to that 40 Hz tone. Such a time delay produces audible effects, primarily in the appar-

ent location of sound sources.

The time delays caused by the filters in CD players are much smaller—only in the microsecond range—because the frequencies most effected are much higher, near the limits of audibility. For example, a 360° phase shift at 10 Hz, an octave down from the approximate location of most analog CD output filters, will only cause a time delay of 70 microseconds between 10,000 Hz and 20,000 Hz because a full wave cycle only encompasses 70 microseconds at 10,000 Hz. Furthermore, the time delay in CD players grow less as the frequencies in question drop because phase shift rapidly decreases below the 20,000 Hz corner frequency. Through most of the musical spectrum, the time delays between adjacent octaves are even less than 10 microseconds.

Are such tiny time delays audible, or, to rephrase the question, do they produce audible effects?

They are certainly not directly audible in the sense that a person can hear tones spaced a few microseconds apart as distinctly separate sounds. They may be indirectly audible though. The late Carolyn Puddie Rodgers, a psychoacoustician who performed many experiments involving sound localization by means of frequencies in the 3,000 Hz to 20,000 Hz range, speculated that the ability of humans to localize by means of very high frequencies might be due to a capacity for sensing time delays in the microseconds. But Raymond Cooke and Siegfried Linkwitz, respected loudspeaker designers who favor steep 24-dB filters in loudspeaker crossovers have reported listening experiments where 360° phase shifts in the midrange have gone undetected in blind tests. The scientific literature on the audibility of phase shift and time delay is extremely extensive, going back to the turn of the century, and after scores of published experiments the controversy continues. The recent divergence of opinion represented by Rodgers on the one hand, and Cooke and Linkwitz on the other, represents only the latest ramifications in a very old debate.

Regardless of the lack of conclusive evidence for the audibility of high-frequency phase shift, flat phase response across the entire audio spectrum has come to be deemed very desirable in high circles. It's no surprise that the designers of high-end CD players set about constructing output filters that would minimize phase shift within the audible bandpass.

Most attempts to produce a mini-

mum phase output filter have involved oversampling—multiplying the samples in the digital domain two or four times, then removing the frequencies in the octave or two above the 20,000 Hz limit by manipulating the digital data, and then finally using an analog output filter to remove the new 88.2 kHz or 176.4 kHz sampling frequencies entailed by the oversampling process. In effect, the problems are moved up an octave or two, but by this simple stratagem they thereby become less acute in that the higher clock frequency can be filtered down to a very low level by use of a relatively shallow filter placed in the 20,000 Hz region. It might be objected that the high frequency clock could still cause mischief with very wideband amplifiers, but most high-end designers seem to think that oversampling is the preferable method. The slower filter slopes it permits generally cause much less phase shift and envelope distortion than is the case with conventional steep filters, though in most cases, some phase shift is still present in the top octave.

Oversampling itself is not all that esoteric. Most of the cheaper mass market Japanese and Korean CD players don't use it, but all Sony and Philips based players have oversampling, including the cheapest Marantz and Magnavox pieces. The high-end oversampling players are differentiated from the common sort chiefly in the design of their analog output filters which usually take some sort of proprietary configuration. A couple of oversampling players also have unique D/A converters which we will consider in the later section.

The customized output filters in the high-end players are usually designed to produce less phase shift in the audible region than is the case with stock filters. One method of reducing phase shift is to add an all-pass filter with a phase shift of its own that compensates for that of the bandpass filter. This tactic increases the number of elements in the output filter, attenuates signal strength, and increases distortion. Another method, one used by Shure and ADS, is to move the corner frequency up past 30,000 Hz instead of placing it in the 20,000 Hz region. The higher corner frequency leaves spikes from the digital circuitry unfiltered in the first half octave above the audible range on the theory that these lower frequency ultrasonic noise components won't be heard directly and won't overload most amplifiers either. Higher frequency spuriae are of

course filtered out because many amps will in fact misbehave in their presence. Naturally this higher corner frequency permits a slower slope filter to be used at output.

One high-end designer, Ed Meitner, president of Meitner Audio, claims to have produced a deck with no analog output filter at all. Mr. Meitner indicates that only digital filtering is used in his design, but he gives no specifics of how the oversampling frequency is removed (the 88.2 kHz and 176.4 kHz clock frequencies produced by all other oversampling players are immune to digital filtering). The Meitner player is not yet commercially available, but is supposed to be released in late 1986 or early '87, and will be distributed by Assemblage.

### *Power Supplies*

Power supplies are a second area of CD player design where high-end manufacturers have tended to concentrate their efforts, and here they may be on firmer ground. Digital power supplies are notoriously dirty and noisy, and though digital circuits themselves are remarkably tolerant of dirty supplies, an analog audio circuit is remarkably intolerant. It wants a smooth, ripple-free source of direct current.

Digital circuits themselves consist of transistors acting as switches. The operation of these solid state switches creates high-intensity electrical spikes which manifest themselves as eddies within the power supply. Such eddies may upset the operation of analog signal circuits feeding off the power supplies. Such eddies or ripple may be suppressed by use of solid state regulators or simply by building supplies of massive storage capacities, but it's difficult to suppress ripple entirely when analog and digital circuits share a power supply, and the effect of such spikes modulating the power supply is to increase the noise and intermodulation distortion components in the audio signal.

Such noise and distortion will not show up in standard signal/noise ratio tests where the noise floor is measured at no signal condition with digital bits set at 0, but it will appear during actual musical reproduction.

A simple but effective solution to the ripple problem is to use two separate supplies, one for the digital and electromechanical sections of the deck, and another for the analog output section. Many high end and esoteric players do in fact use two supplies, including units by Luxman, Onkyo, Kyocera, PS Audio, Distech,

Mission, and Meridian.

To be sure, switching noise may be radiated to the analog section, or may travel through the chassis or through poor electrical grounds even with separate supplies, and some manufacturers have attempted to address such potential problems. Some use one point star grounding, a scheme favored by Onkyo, PS Audio, and Luxman, and others, such as Meridian and Kyocera, feature extensive shielding around the digital power supply.

Perhaps the most extreme method for isolating the analog from the digital circuitry is the use of fiber optical connections to carry the digitized signal from the decoding section to the D/A converter. This still leaves one source of switching noise, the D/A converter itself, in proximity to the analog output section, but at least it separates the other digital circuits at least as far as the signal path is concerned. Unfortunately such linkages cannot prevent radiated noise from reaching the analog section. Only proper shielding can do that. Fiber optical linkages are currently used in Onkyo and Nakamichi players.

### *Buffer Amps*

The third area of CD player design where high-end companies are active is in the configuration of the output amplifier following the analog filter.

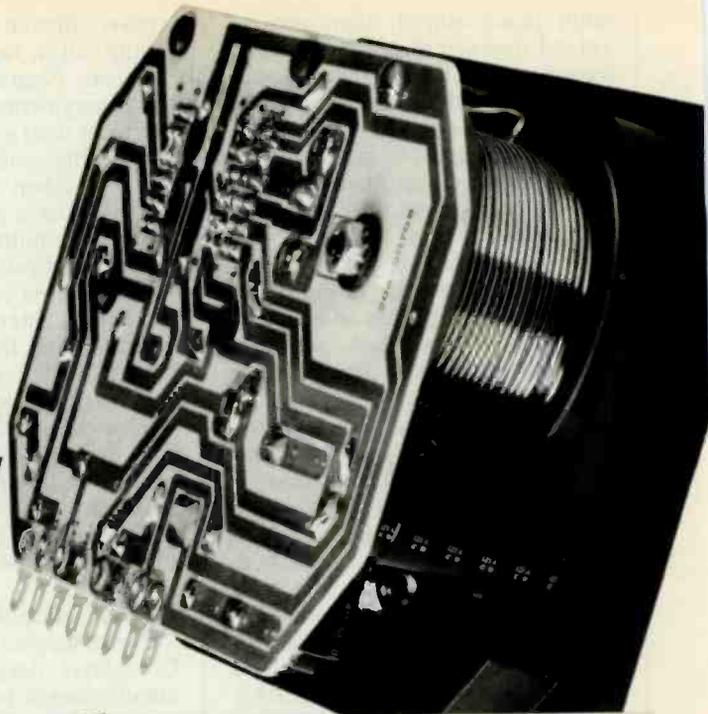
This output amp is a relatively simple current-to-voltage device primarily intended to match the impedance of the signal output to the following stage, generally a line amplifier in a component stereo system. In mass market players the output amp is an IC op amp, but in high end players this section is frequently discrete, with hand-matched transistors and passive components. Such discrete output stages are present in players by PS Audio, Kinergetics, Revox, Kyocera, Distech, and Meridian, though by no means all high end CD players are so equipped.

Here again in this matter of discrete outputs high-end designers contrive to meet the expectations of their clientele. Prevailing high end folklore has it that IC op amps sound harsh and gritty, and ICs have come to be as disreputable as caffeine in soda.

Perhaps the ultimate extreme in buffer amp design for CD players has been achieved by a firm calling itself California Audio Technology and based in Los Angeles. Their CD player, incidentally the largest and heaviest in existence, features a vacuum tube output!

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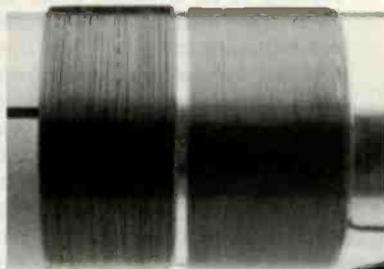
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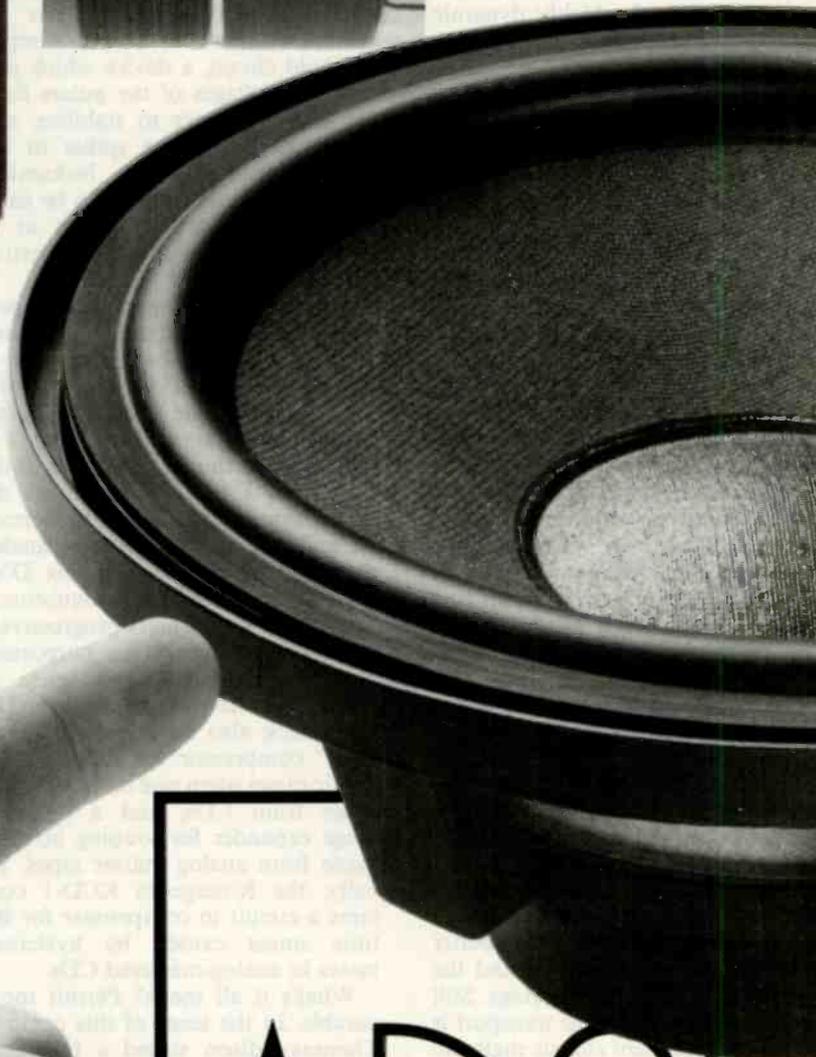




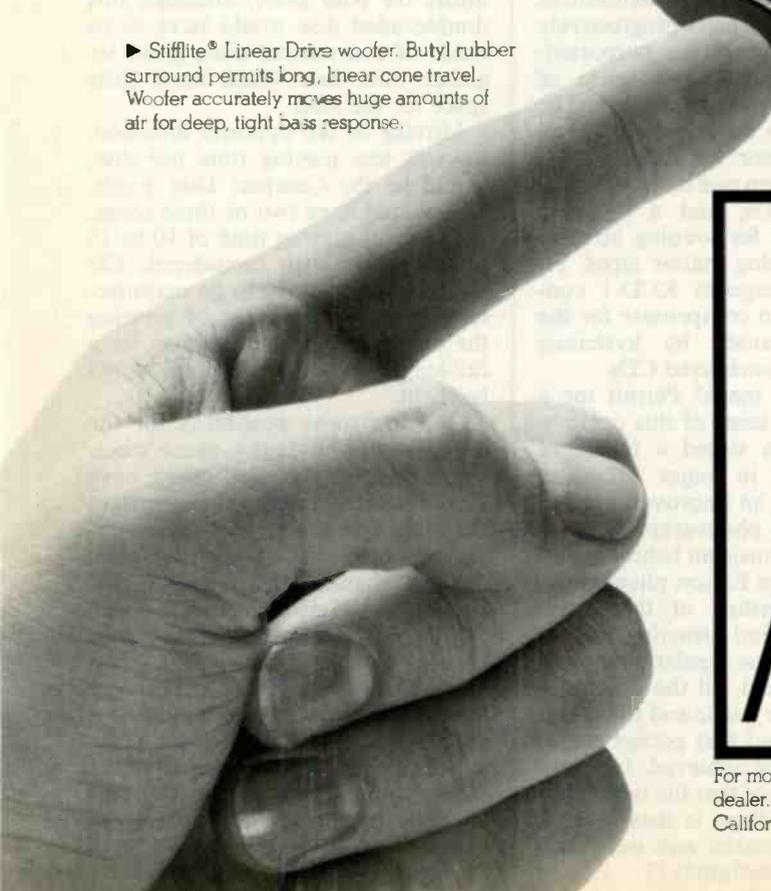
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of the archaic vacuum tube in the formidably high-tech CD format, tubes do have at least a couple of points in their favor in this application. Vacuum tubes are generally less upset than transistors by minor power supply perturbations caused by switching glitches (due in part to the relatively high voltage supply rails from which they operate) and tubes themselves swing high voltages easily, affording tube voltage amplification sections tremendous headroom for coping with the highly dynamic signals from the output of the D/A converter.

### *Isolation*

The final quick fix mod which commonly crops up in high-end players is the introduction of some sort of suspension for acoustical and mechanical isolation. The informing theory here is that vibrations reaching the disc's surface can cause the laser pickup to mistrack.

One might question the need for isolation in that all Compact Disc players have servo mechanisms for keeping the optical assembly in precise focus, and error concealment circuits for reconstructing lost signal content based on adjacent samples, but given the very narrow track width and high rotational speed of the Compact Disc, it's probably best not to ask too much of the servos. Keeping the disc surface stable seems to be a good idea.

The most common way to isolate the transport is to use a floating, spring-suspended subchassis similar to those employed in most high-end turntables such as the AR, the Linn, the Oracle, etc. Subchassis are used in Compact Disc players by Mission, Meridian, and Cambridge, among others. A similar tactic, one used by Yamaha, is to place rubber buffer pads between the subchassis and the main chassis in place of springs. Still another way to isolate the transport is to use a nonresonant chassis material. Kyocera employs a massive base made of acoustically inert aluminum oxide fine ceramics, while Sony uses a dead plastic material called cerasin in its high-end ES line. One might note that both Kyocera and Yamaha also isolate signal circuitry in nonresonant housings on the theory that transistors are microphonic (the sound they are transmitting being affected by the sound from the speakers).

### *Unique Processing*

Most CD players, regardless of cost, use stock, off-the-shelf digital-to-analog converters. Among those

that don't are Cambridge, Kyocera, and Nakamichi players, which all feature four-times oversampling (other four-times oversampling players achieve 16-bit dynamic range from a 14-bit D/A converter by means of a noise-shaping circuit). These three exceptions use custom D/A converters.

Of these custom chips, three Nakamichi's is perhaps the most interesting. Nakamichi's converter is followed directly by the analog output filter; all other players on the market interpose what is known as an aperture circuit or output sample-and-hold circuit, a device which permits the voltages of the pulses from the D/A converter to stabilize, and which minimizes the spikes in the output waveform. The Nakamichi D/A converter is claimed to be sufficiently precise and noiseless as to eliminate the need for the aperture circuit.

A number of companies have produced players with circuits following the D/A converter for the purpose of tailoring the sound. Carver Corporation's Digital Time Lens, incorporated in their Carver Compact Disc Player, alters the tonal balance of the L+R and L-R components of the stereo signal in an attempt to recreate the ambient cues conveyed by analog phonograph records. The dbx DX3 also has an ambience enhancement circuit of a sort. Their progressively reduces stereo separation, purportedly to provide a greater sense of centerfill in stereo reproduction. The same deck also contains an "Over-Easy" compressor for reducing dynamic range when one is copying cassettes from CDs, and a dynamic range expander for souping up CDs made from analog master tapes. Finally, the Kinergetics KCD-1 contains a circuit to compensate for the time smear caused by hysteresis losses in analog-mastered CDs.

What's it all mean? Permit me a parable. In the teens of this century, Thomas Edison staged a bunch of demonstrations in major American cities involving an improved version of his cylinder phonograph. Edison would place a musician behind a curtain as well as an Edison phonograph playing a recording of that same musician—a blind listening test, if you will. The press regularly reported that no one could tell the difference between the live music and the reproduced music, and that perfect reproduction has been achieved. It is also interesting to note that the new cylinders used by Edison is these demos were made of plastic and were supposed to last indefinitely. □

*(continued from page 16)*

recorders will hit the market. A good cassette deck can make a pretty good copy of a CD, so there is not a huge demand for digital audio tape, let alone CD recorders.

Because so much information can be put on a Compact Disc, they will be used to provide information to personal computers. These CDs are in the CD-ROM format, for Compact Disc-Read-Only Memory. They will not store information as a floppy disk does, but will have information on them that can be accessed through a computer. There are already Compact Discs being sold that have encyclopedic amounts of information on them.

One CD could hold 270,000 pages of information, with each page having more than 2,000 characters. A single CD can hold every software program ever written for the IBM Personal Computer: that's a tremendous amount of data, exceeded only by the cost of licensing all that software.

Other potential formats are CD-I, where the interaction between the disc and the user would be taken to new extremes, and CD-V, where the still video potential could be utilized.

It is possible that one CD can have music on both sides, although this double-sided disc would have to be made of two normal discs glued together. And that would leave little space for the label.

Moving in the opposite direction, towards less playing time per disc, would be the Compact Disc single. This would have two or three songs, with a total playing time of 10 to 15 minutes. Although considered, CD singles are not likely to be manufactured, because the costs of pressing the disc would be the same as for a full-length disc, so the savings would be slight.

One intriguing possibility for the future would be double-mono discs, where the left channel would have entirely different sound than the right channel. You could have mono recordings of Enrico Caruso singing on the left channel and Glenn Miller playing on the right channel. You select the channel you want with your balance control. Track access could be tricky, but it might be arranged so the even tracks were for one channel and the odd tracks were for the other. It would be wonderful if some of the classic mono recordings of the past could be immortalized in millions of digits on the polycarbonate plastic of the marvelous little Compact Disc. □

# A CD PLAYER SHOPPING LIST

by Wendy M. Schaub & John Weinberg

**P**urchasing a Compact Disc player can be confusing as well as fun. Every time you turn around, a new player or feature is being introduced. You wonder if you'll ever be able to decide which player is right for you. Most CD players look alike, with similar features and functions. Yet, all are special. In the meantime, prices keep going down, the choices become greater, and the decision much harder. Many of us leave audio dealers overwhelmed and baffled by the variety of CD players. We want every CD player we saw, yet don't know which one to buy. Fear not, help is on the way.

The shopping list on the following pages is designed to help focus your choice of CD players to those offering the features you most need and want. Listed are the model numbers and suggested retail prices of all the *home* CD players included in this guide. (If you are interested in a car, portable, combo or multiplay CD player, go to the appropriate section—the choices for these types of players are still fairly limited, and most decisions can be made without the aid of a shopping list.) Also given are questions designed to help eliminate those players that do not offer what you want.

Each CD player listed is given a number for easy identification. You will be asked if you want a certain

feature—if you do, you will be told to cross out the numbers of those CD players that do not offer that feature. As a result of elimination, you will be left with a list of CD players that feature what you want and need. Since you might have to go through the questions more than once, it is a good idea to make a few copies of the list on page 33.

Next, review the prices of the remaining players. Delete those players which are out of your allowable price range. Remember though, the prices given are *suggested retail* prices. Prices are set by individual retailers and tend to be *lower* than the suggested retail price. Prices are also subject to change without notice. If all the players on your list are out of your price range, you need to give up some features or increase your budget.

Go to the listings section and read the descriptions of the players that meet your qualifications. (It also won't hurt to read some of the other listings for comparison.) The listings should help narrow your choices down to a manageable few. If you are left with too many choices, be more specific about what you want.

This shopping list is based upon information provided by manufacturers. It is designed to be used as a guide, and not an absolute. It is strongly advised that you go to audio dealers to test and scrutinize the

players that interest you before making any final decision.

The manufacturers' descriptions given for most of the higher-priced high-end CD players do not fit the question format of this shopping list. Most of these players feature innovative and improved technologies with their focus on better sound quality, not more buttons. If you are interested in any of these players, read the descriptive listings in Section 1 of this magazine. For players that are said to sound better, you can check that by listening to them. Remember, how good a particular piece of audio equipment sounds is determined by *your* ears and opinions.

This shopping list does not include common features such as skip forward, skip back, fast forward, fast reverse, and track cueing in its questionnaire because a very large majority of, if not all, CD players include these functions. Analog filtering and (at least) 44.1-kHz sampling are also common to all CD players.

Many of the players listed offer unique features that are not included in the list of questions. This shopping list was designed to provide a basic foundation for choosing a CD player—the different section listings are for the finer points and features. Making use of both will help make choosing and buying a CD player enjoyable instead of confusing. □

**1. If you want remote control, cross out . . .**

2, 7, 9, 12, 13, 14, 24, 28, 31, 32, 38, 39, 40, 42, 45, 51, 52, 63, 69, 71, 79, 83, 84, 85, 89, 92, 94, 95, 101, 108, 109, 110, 111, 112, 113, 115, 116, 118, 121, 122, 123, 124, 125, 127, 130, 131, 132, 133, 134, 136, 139, 140, 141, 142, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 155, 156, 157.

**2. If you want to program from nine to twenty tracks, cross out numbers . . .**

1, 2, 9, 28, 38, 49, 60, 63, 69, 77, 78, 83, 84, 109, 144, 149

**3. If you want to program more than twenty tracks, cross out numbers . . .**

1, 2, 9, 10, 11, 13, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 31, 33, 35, 36, 37, 38, 39, 40, 43, 44, 45, 46, 47, 48, 49, 50, 51, 53, 54, 55, 56, 58, 59, 60, 61, 62, 63, 64, 66, 69, 70, 71, 73, 74, 76, 77, 78, 79, 80, 81, 82, 83, 84, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 102, 104, 105, 106, 107, 108, 109, 112, 113, 115, 116, 118, 119, 120, 121, 122, 123, 124, 126, 127, 128, 129, 130, 131, 132, 134, 137, 138, 140, 141, 142, 143, 144, 145, 148, 149, 150, 152, 153, 154, 155, 156, 157.

**4. If you want the cancel feature, cross out numbers . . .**

1, 2, 5, 6, 7, 9, 13, 17, 22, 24, 25, 27, 28, 29, 37, 38, 39, 42, 43, 46, 48, 49, 52, 54, 59, 60, 63, 64, 65, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 83, 84, 85, 92, 93, 94, 95, 99, 100, 102, 103, 104, 105, 107, 108, 109, 113, 114, 115, 116, 117, 118, 119, 120, 122, 123, 125, 126, 127, 128, 131, 132, 134, 135, 136, 137, 138, 139, 143, 144, 145, 146, 148, 149, 150, 153, 154, 155, 156, 157.

**5. If you want to repeat a disc, cross out numbers . . .**

2, 8, 9, 19, 28, 35, 52, 60, 63, 69, 72, 85, 99, 105, 107, 113, 128, 133, 134, 135, 144, 146, 149, 151, 152.

**6. If you want to repeat a track, cross out numbers . . .**

2, 6, 7, 8, 9, 14, 19, 28, 35, 38, 39, 52, 60, 64, 66, 68, 69, 72, 73, 76, 80, 85, 102, 103, 107, 109, 113, 123, 125, 128, 131, 135, 137, 138, 144, 146, 149, 151, 152, 153.

**7. If you want to repeat a program, cross out numbers . . .**

1, 2, 8, 9, 19, 28, 35, 38, 52, 60, 65, 69, 72, 77, 78, 81, 85, 89, 94, 95, 105, 107, 109, 113, 114, 116, 119, 120, 122, 124, 126, 128, 131, 133, 135, 143, 144, 145, 146, 148, 149, 150, 151, 152, 155.

**8. If you want to repeat a phrase, cross out numbers . . .**

2, 4, 5, 6, 7, 8, 9, 13, 17, 18, 19, 24, 27, 28, 30, 31, 32, 35, 37, 38, 39, 45, 46, 48, 49,

52, 53, 54, 57, 59, 63, 64, 65, 66, 68, 72, 75, 77, 78, 80, 81, 82, 83, 84, 85, 87, 88, 89, 90, 91, 93, 94, 95, 96, 97, 98, 99, 102, 103, 104, 105, 107, 109, 111, 112, 113, 114, 116, 117, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 139, 143, 144, 145, 146, 148, 149, 150, 151, 152, 154, 155, 156, 157.

**9. If you want cueing by track and index, cross out numbers . . .**

2, 6, 7, 11, 19, 21, 23, 26, 32, 34, 35, 38, 42, 43, 46, 47, 49, 51, 53, 54, 58, 60, 62, 63, 64, 65, 66, 69, 70, 72, 73, 75, 79, 80, 81, 82, 85, 89, 90, 91, 96, 97, 98, 102, 103, 104, 105, 106, 107, 109, 112, 113, 114, 115, 116, 119, 120, 121, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 137, 139, 142, 144, 146, 148, 149, 150, 151, 152, 156.

**10. If you want cueing by track and time, cross out numbers . . .**

1, 2, 3, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 18, 19, 20, 21, 24, 25, 26, 27, 28, 29, 30, 32, 33, 35, 36, 37, 38, 39, 40, 42, 43, 45, 46, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 62, 63, 64, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 100, 101, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157.

**11. If you want sound the audible during fast scans, cross out numbers . . .**

1, 2, 3, 4, 6, 7, 12, 13, 14, 18, 19, 23, 24, 25, 27, 28, 30, 32, 34, 35, 37, 43, 48, 49, 51, 52, 54, 60, 65, 66, 68, 69, 75, 77, 78, 80, 81, 87, 88, 89, 93, 94, 95, 98, 102, 105, 107, 112, 113, 114, 116, 119, 120, 122, 123, 126, 128, 131, 132, 134, 135, 137, 139, 141, 144, 145, 146, 148, 149, 150, 152, 153, 154, 157.

**12. If you want a headphone jack, cross out numbers . . .**

1, 2, 4, 5, 7, 9, 13, 18, 22, 28, 30, 32, 33, 34, 40, 42, 43, 45, 46, 48, 51, 56, 59, 60, 61, 62, 64, 65, 66, 67, 69, 70, 71, 72, 74, 76, 78, 79, 81, 85, 86, 88, 89, 91, 92, 94, 95, 98, 100, 101, 102, 104, 105, 106, 107, 108, 109, 110, 111, 112, 114, 115, 116, 118, 119, 121, 124, 126, 127, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 146, 147, 148, 151, 153, 155, 156.

**13. If you want a headphone jack with variable level, cross out numbers . . .**

1, 2, 4, 5, 7, 9, 13, 18, 22, 24, 28, 30, 31, 32, 33, 34, 38, 39, 40, 42, 43, 45, 46, 48, 51, 56, 59, 60, 61, 62, 64, 65, 66, 67, 69,

70, 71, 72, 74, 76, 78, 79, 81, 85, 86, 88, 89, 91, 92, 94, 95, 97, 98, 100, 101, 102, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 118, 119, 121, 122, 124, 125, 126, 127, 128, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157.

**14. If you want display of track number, cross out numbers . . .**

2, 7, 107.

**15. If you want display of elapsed time of disc, cross out numbers . . .**

2, 3, 5, 7, 8, 9, 11, 13, 14, 22, 26, 27, 28, 29, 30, 37, 38, 39, 42, 43, 44, 45, 47, 48, 49, 51, 52, 53, 54, 55, 57, 59, 60, 61, 64, 68, 70, 71, 73, 74, 76, 77, 78, 79, 80, 81, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 98, 100, 102, 103, 107, 108, 109, 112, 113, 114, 115, 116, 117, 118, 120, 122, 125, 128, 129, 132, 133, 134, 135, 136, 137, 138, 140, 141, 144, 145, 146, 148, 149, 151, 152, 153, 156.

**16. If you want display of elapsed time of track, cross out numbers . . .**

2, 7, 19, 28, 29, 35, 38, 50, 51, 52, 53, 77, 78, 82, 83, 84, 94, 95, 96, 105, 107, 113, 120, 123, 126, 131, 134, 152.

**17. If you want display of remaining time of disc, cross out numbers . . .**

2, 5, 7, 11, 13, 18, 19, 24, 25, 28, 30, 32, 35, 37, 38, 39, 40, 42, 43, 45, 47, 48, 51, 52, 54, 62, 67, 68, 69, 70, 71, 72, 74, 76, 77, 78, 79, 80, 85, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 102, 103, 105, 107, 108, 110, 111, 113, 114, 115, 117, 119, 120, 122, 124, 125, 126, 128, 134, 135, 136, 137, 138, 143, 144, 145, 146, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157.

**18. If you want display of program in memory, cross out numbers . . .**

1, 2, 4, 6, 7, 9, 13, 19, 24, 26, 27, 28, 30, 35, 36, 37, 38, 43, 45, 48, 51, 52, 54, 65, 68, 70, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 84, 85, 87, 88, 89, 92, 93, 94, 95, 101, 102, 103, 105, 107, 108, 109, 113, 114, 116, 117, 122, 123, 125, 126, 128, 131, 132, 134, 135, 136, 137, 138, 141, 143, 144, 145, 146, 147, 148, 149, 151, 152, 153, 154, 155, 156.

**19. If you want digital filtering, cross out numbers . . .**

2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 20, 22, 24, 26, 28, 30, 37, 38, 40, 43, 44, 45, 49, 53, 55, 59, 60, 64, 66, 68, 69, 70, 71, 74, 77, 78, 79, 81, 87, 88, 90, 92, 94, 95, 96, 97, 98, 100, 101, 103, 104, 105, 107, 108, 109, 110, 111, 112, 113, 114, 117, 118, 119, 120, 123, 125, 126, 127, 128, 129, 130, 131, 132, 134, 135, 136, 138, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 153, 154, 155, 156, 157.

**20. If you want dual D/A converters, cross out numbers . . .**

2, 4, 7, 14, 17, 18, 22, 24, 25, 26, 27, 30, 31, 32, 35, 36, 37, 40, 41, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 54, 55, 57, 58, 59, 60, 61, 62, 63, 64, 66, 67, 68, 69, 70, 71, 72, 74, 77, 78, 79, 80, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 115,

117, 118, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 147, 148, 149, 151, 152, 153, 154, 155, 156, 157.

**21. If you want double oversampling (88.2 kHz), cross out numbers . . .**

1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 13, 14, 16, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 32, 34,

35, 36, 37, 38, 39, 42, 43, 48, 49, 52, 53, 54, 57, 59, 60, 64, 65, 66, 69, 70, 71, 75, 76, 77, 78, 79, 83, 84, 87, 88, 89, 90, 92, 93, 94, 95, 96, 98, 99, 100, 101, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 117, 118, 119, 120, 122, 123, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155-157.

## HOME COMPACT DISC PLAYERS\*

_____ 1. Accuphase 80/81 . . . . .	\$7,000	_____ 54. Kyocera DA-610 . . . . .	\$550	_____ 107. Proton 830R . . . . .	\$349
_____ 2. Cambridge CD1 . . . . .	\$2,495	_____ 55. Sony CDP-302 II . . . . .	\$550	_____ 108. Teac PD-100 . . . . .	\$349
_____ 3. Kyocera DA-910 . . . . .	\$1,600	_____ 56. Carver DTL-50 . . . . .	\$549	_____ 109. NAD 5330 . . . . .	\$348
_____ 4. Luxman D-03 . . . . .	\$1,500	_____ 57. Pioneer PD-9010X . . . . .	\$540	_____ 110. Akai CD-M515 . . . . .	\$340
_____ 5. Meridian 207 . . . . .	\$1,500	_____ 58. Technics SL-P500 . . . . .	\$520	_____ 111. Akai CD-A30 . . . . .	\$340
_____ 6. Audioquest TCD-10 . . . . .	\$1,495	_____ 59. Kenwood DP-1000 IIB . . . . .	\$510	_____ 112. ADC 16/1 . . . . .	\$330
_____ 7. Man MCD-1 . . . . .	\$1,490	_____ 60. Adcom GCD-300 . . . . .	\$500	_____ 113. Denon DCD-500 . . . . .	\$330
_____ 8. Nakamichi OMS-7AII . . . . .	\$1,375	_____ 61. Sony CDP-203 . . . . .	\$500	_____ 114. Magnavox CDB560 . . . . .	\$330
_____ 9. Nakamichi OMS-5AII . . . . .	\$1,375	_____ 62. Vector Res. VCD-900 . . . . .	\$500	_____ 115. Marantz CD-152 . . . . .	\$330
_____ 10. Sony CDP-650ESII . . . . .	\$1,300	_____ 63. Toshiba XR-V11 . . . . .	\$499	_____ 116. Marantz CD-30 . . . . .	\$330
_____ 11. Tandberg TCP 3015A . . . . .	\$1,295	_____ 64. NAD 5355 . . . . .	\$498	_____ 117. Mitsubishi DP-209R . . . . .	\$330
_____ 12. ADS Atelier CD3 . . . . .	\$1,250	_____ 65. AR CD-04 . . . . .	\$480	_____ 118. Sony CDP-45 . . . . .	\$330
_____ 13. DiscTech LSI MKII . . . . .	\$1,195	_____ 66. Luxman D-100 . . . . .	\$480	_____ 119. Sylvania CD1560 . . . . .	\$330
_____ 14. Kyocera DA-810 . . . . .	\$1,100	_____ 67. Akai CD-A70 . . . . .	\$475	_____ 120. NEC CD-500E . . . . .	\$329
_____ 15. Teac ZD-5000 . . . . .	\$1,100	_____ 68. Pioneer PD-7030(BK) . . . . .	\$470	_____ 121. Technics SL-P110 . . . . .	\$320
_____ 16. JVC XL-V100BK . . . . .	\$1,000	_____ 69. Adcom GCD-200 . . . . .	\$450	_____ 122. Yamaha CD-400B . . . . .	\$319
_____ 17. Technics SL-P1200 . . . . .	\$1,000	_____ 70. Hitachi DA6001 . . . . .	\$450	_____ 123. Kenwood DP-850(B) . . . . .	\$315
_____ 18. Bang & Olufsen CD50 . . . . .	\$999	_____ 71. Hitachi DA500 . . . . .	\$450	_____ 124. Onkyo DX-120 . . . . .	\$300
_____ 19. Nakamichi OMS-4A . . . . .	\$995	_____ 72. Sherwood CDP-310R . . . . .	\$450	_____ 125. Pioneer PD-5030(BK) . . . . .	\$300
_____ 20. Sony CDP-620ES II . . . . .	\$950	_____ 73. NEC CD-650E . . . . .	\$449	_____ 126. Sanyo CP 710 . . . . .	\$300
_____ 21. Teac ZD-3000 . . . . .	\$950	_____ 74. Teac PD-400 . . . . .	\$449	_____ 127. Scott 950DA . . . . .	\$300
_____ 22. ADS Atelier CD4 . . . . .	\$900	_____ 75. Magnavox CDB650 . . . . .	\$430	_____ 128. Sharp DX-620(BK) . . . . .	\$300
_____ 23. Mission PCM 7000R . . . . .	\$899	_____ 76. Audio-Technica CD20 . . . . .	\$400	_____ 129. Sony CDP-7F . . . . .	\$300
_____ 24. Yamaha CD-2000M . . . . .	\$899	_____ 77. Denon DCD-700 . . . . .	\$400	_____ 130. Technics SL-PJ11 . . . . .	\$300
_____ 25. Revox B 225 . . . . .	\$849	_____ 78. Fisher AD-815B . . . . .	\$400	_____ 131. Toshiba XR-30 . . . . .	\$300
_____ 26. Hitachi DA005 . . . . .	\$800	_____ 79. Hitachi DA600 . . . . .	\$400	_____ 132. ADC CD 100X . . . . .	\$299
_____ 27. Yamaha CD-2000B . . . . .	\$799	_____ 80. JVC XL-V440BK . . . . .	\$400	_____ 133. Magnavox FD2041 SL . . . . .	\$299
_____ 28. Kinergetics KCD-20 . . . . .	\$795	_____ 81. Marantz CD-50 . . . . .	\$400	_____ 134. Sylvania FDE203 . . . . .	\$299
_____ 29. Kyocera DA-710CX . . . . .	\$750	_____ 82. Onkyo DX-220 . . . . .	\$400	_____ 135. Magnavox FD1051 BK . . . . .	\$290
_____ 30. Mission DAD7000R . . . . .	\$749	_____ 83. Sansui CD-E750 . . . . .	\$400	_____ 136. Mitsubishi DP-109 . . . . .	\$280
_____ 31. NEC CO-705 . . . . .	\$749	_____ 84. Sansui CD-V350 . . . . .	\$400	_____ 137. JVC XL-V220BK . . . . .	\$275
_____ 32. Bang & Olufsen CDX . . . . .	\$699	_____ 85. Sherwood CDP-300R . . . . .	\$400	_____ 138. GE 11-4911 . . . . .	\$270
_____ 33. Carver DTL-200 . . . . .	\$699	_____ 86. Sony CDP-55 . . . . .	\$400	_____ 139. Panasonic SL-P3600 . . . . .	\$270
_____ 34. Mission PCM 7000 . . . . .	\$699	_____ 87. RCA MCD-145 . . . . .	\$399	_____ 140. Sony CDP-35 . . . . .	\$270
_____ 35. Nakamichi OMS-3A . . . . .	\$699	_____ 88. RCA MCD-141 . . . . .	\$399	_____ 141. Sony CDP-25 . . . . .	\$270
_____ 36. Teac ZD-700 . . . . .	\$699	_____ 89. Rotel RCD850 . . . . .	\$399	_____ 142. Sony CDP-170 . . . . .	\$265
_____ 37. Yamaha CD-1000B . . . . .	\$699	_____ 90. Shure Brothers SV40 . . . . .	\$399	_____ 143. Realistic CD-1400 . . . . .	\$260
_____ 38. Audioquest CD-1 . . . . .	\$695	_____ 91. Shure Brothers D5000 . . . . .	\$399	_____ 144. Sharp DX-610(BK) . . . . .	\$260
_____ 39. Sonographe SD-1 . . . . .	\$695	_____ 92. Teac PD-200 . . . . .	\$399	_____ 145. Yamaha CD-300B . . . . .	\$259
_____ 40. Carver DTL . . . . .	\$650	_____ 93. Yamaha CD-500B . . . . .	\$399	_____ 146. Magnavox CDB460 . . . . .	\$250
_____ 41. Denon DCD-1500 . . . . .	\$650	_____ 94. Fisher AD-924B . . . . .	\$380	_____ 147. Quasar CD8956 . . . . .	\$250
_____ 42. Marantz CD-74 . . . . .	\$650	_____ 95. Fisher AD-922B . . . . .	\$380	_____ 148. Sanyo CP 700 . . . . .	\$250
_____ 43. Hitachi DA501 . . . . .	\$600	_____ 96. Aiwa DX-1500 . . . . .	\$375	_____ 149. Sharp DX-110(BK) . . . . .	\$250
_____ 44. Sony CDP-520ES II . . . . .	\$600	_____ 97. Technics SL-P310 . . . . .	\$375	_____ 150. Sylvania CD1460 . . . . .	\$250
_____ 45. dbx DX3 . . . . .	\$599	_____ 98. ADC 16/2R . . . . .	\$370	_____ 151. Magnavox FD1041 BK . . . . .	\$240
_____ 46. NEC CD-607 . . . . .	\$599	_____ 99. Sansui CD-V550R . . . . .	\$370	_____ 152. Sylvania D1150 . . . . .	\$240
_____ 47. Shure Brothers D6000 . . . . .	\$599	_____ 100. Sony CDP-50 . . . . .	\$370	_____ 153. GE 11-4800 . . . . .	\$230
_____ 48. Yamaha CD-700B . . . . .	\$599	_____ 101. Akai CD-A3X . . . . .	\$350	_____ 154. Sears Roebuck 9755 . . . . .	\$230
_____ 49. Luxman D-404 . . . . .	\$580	_____ 102. JVC XL-V330BK . . . . .	\$350	_____ 155. Realistic CD-2200 . . . . .	\$200
_____ 50. Onkyo Integra DX-320 . . . . .	\$580	_____ 103. Pioneer PD-6030(BK) . . . . .	\$350	_____ 156. RCA CD180 . . . . .	\$199
_____ 51. Harman Kardon HD300 . . . . .	\$575	_____ 104. Scott 960DA . . . . .	\$350	_____ 157. Sears Roebuck 9754 . . . . .	\$180
_____ 52. Denon DCD-1300 . . . . .	\$550	_____ 105. Toshiba XR-35 . . . . .	\$350		
_____ 53. Kyocera DA-610CX . . . . .	\$550	_____ 106. Vector Res. VCD-770 . . . . .	\$350		

\*Excluding combo players and CD changers.

# Portable

## COMPACT DISC PLAYERS

BY MYRON BERGER

Small, light, and easy-to-carry CD players can fill your head with music whether you are indoors or outdoors.

**T**here is, in my opinion, only one piece of audio equipment more desirable than a Compact Disc player—and that is a *portable* Compact Disc player.

In the memorable, if somewhat hyperbolic, words of a chewing-gum advertisement, portable players are “double the pleasure, double the fun.” This extra measure of pleasure is derived from the double utility of portables: they are at home both at home and on the go. They provide high-quality sound in a home system with an AC adapter or outdoors with a battery pack. Unlike portable radios and cassette decks, however, portable CD players are not generally inferior to home CD players; they are simply smaller.

Contrary to appearances, many, if not virtually all, portable devices possess features similar and performance comparable to their larger cousins. Indeed, one portable player (the Toshiba XR-P9) even offers remote control (for when the unit is used in a home system). At the moment, however, no portable player can handle more than one disc at a time, so if you want a multi-disc CD changer, you can only enjoy that convenience at home or in the car.

### Looks and Size

Currently, the crop of portable players is remarkably similar in price, performance, and features. Unlike home units, they offer no high and low ends. (It might be said that all portable CD players are low-end

models, but it cannot be questioned that their audio performance and features are most impressive.) There may not be a lot of difference between one player and the next. One exception to this rule of homogeneity is a limited number of models (only four at this time) with built-in radio tuners.

As a very general rule, then, portable players are approximately the size of three or four jewel boxes. They include an LCD window to display current track number, play/remaining time, and, occasionally, programming information. The transport functions, like standard home units, frequently include audible skip/search and track skip (forward and backward). The one feature found on some home units that has not yet migrated to portables is index search.

Virtually all portable players have three jacks: headphone out, DC power in, and line out. The latter two are designed for use of the player in a home audio system. In most, though not all units, the battery is external to the player, rather than in a compartment in the body, as on most portable radios and tape players.

### Power Supplies

Although most players use rechargeable battery packs molded specifically to the player's body, some, such as the Pioneer PD-C7S, come with an empty battery pack which accepts standard alkaline or rechargeable nickel-cadmium cells.

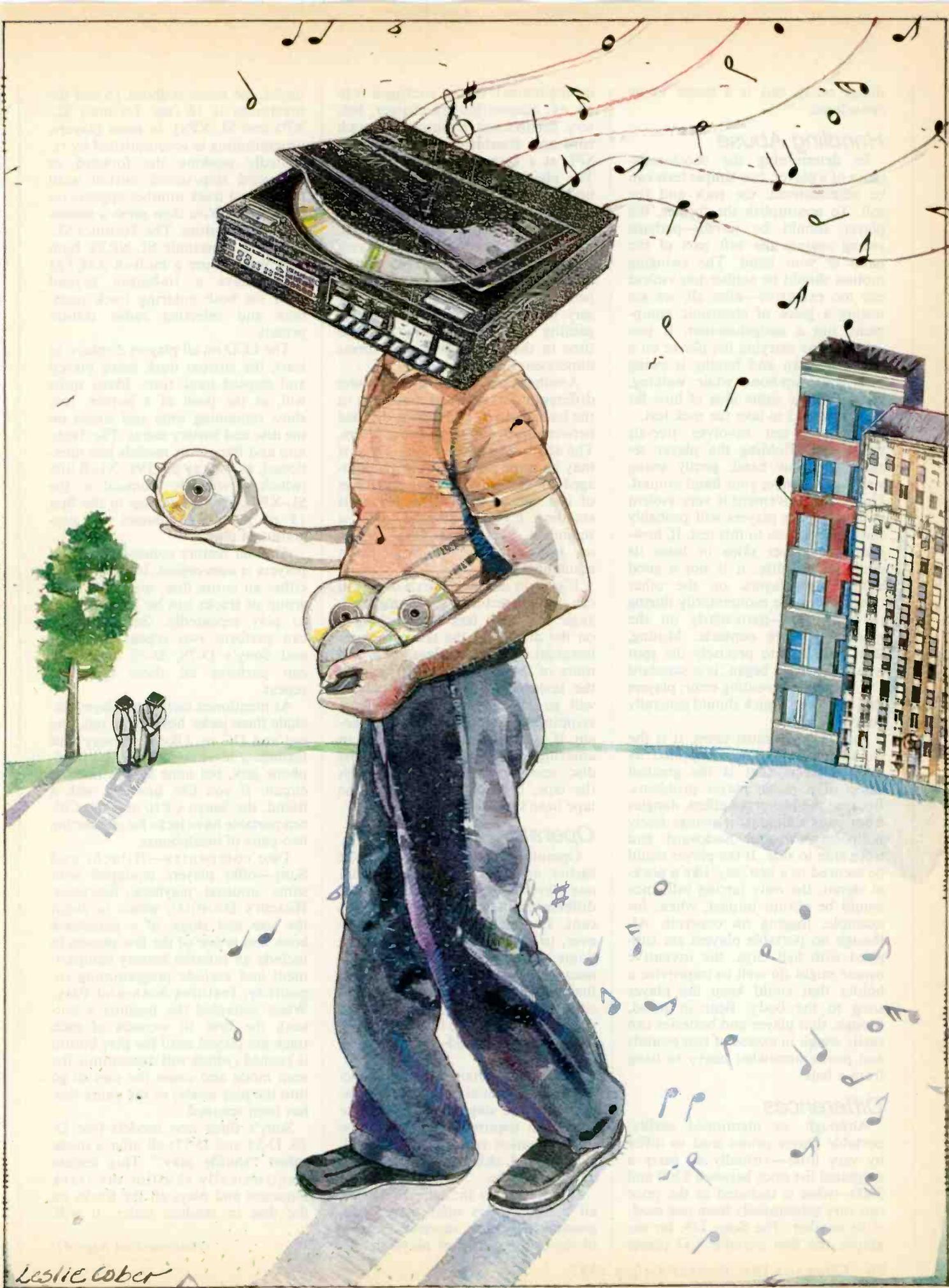
While rechargeables have obvious benefits, it should be kept in mind that with overseas travel to countries which do not adhere to the US 110-volt, 60-hertz format it will be much easier to pick up batteries along the way, rather than carry a charger and power converter.

If you plan to use your player as a portable, you have a choice between battery packs that snap onto the player or the kind that are a combination battery pack and carrying case. The snap-on type is small and convenient, but the carrying case can help cushion the player from jolts and prevent mistracking. Choose the battery pack that suits your needs.

### Portables for the Home

It is generally accepted among audio manufacturers that most portable players are purchased with portability as a second consideration. That is, most units end up connected to a home audio system, with, perhaps, only occasional forays into the outside world.

And, indeed, there are two clear benefits to stationary use of a portable player: if space is at a premium, CD performance can be added with virtually no sacrifice of space and, secondly, because portable units are designed to withstand the rough and tumble violence of swinging from a walker's shoulder, they are more likely to ignore the vibrations and shocks that might discombobulate a home player and make it skip. So, especially if you often abuse your player by whacking it or dropping



Leslie Cober

things on it, this is a factor to be considered.

## Handling Abuse

In determining the shock-resistance of a player, two simple tests can be administered: the rock and the roll. To accomplish the former, the player should be jarred—perhaps swung against the soft part of the palm of your hand. The swinging motion should be neither too violent nor too extensive—after all, we are testing a piece of electronic equipment, not a sledgehammer. If you can imagine carrying the player on a shoulder strap and having it swing into your hip-bone while walking, you will have some idea of how far and how hard to take the rock test.

The roll test involves free-air movement. Holding the player securely in your hand, gently swing your arm or wave your hand around. Unless the movement is very violent or jerky, most players will probably show no reaction to this test. If, however, the player skips or loses its place on the disc, it is not a good sign. Most players, on the other hand, will mute momentarily during the rock test—particularly on the more aggressive contacts. Muting, then returning to precisely the spot where the mute began, is a standard CD method of avoiding error; players that skip or mistrack should generally be avoided.

Ironically, in most cases, it is the shoulder carrying case supplied by manufacturers that is the greatest cause of portable player problems. Because the player, in effect, dangles from your shoulder, it swings freely both forward and backward and from side to side. If the player could be secured to a belt, say, like a pocket stereo, the only jarring influence would be abrupt impact, when, for example, jogging on concrete. Although no portable players are supplied with belt clips, the inventive owner might do well to improvise a holder that could keep the player snug to the body. Bear in mind, though, that player and batteries can easily weigh in excess of two pounds and prove somewhat heavy to hang from a belt.

## Differences

Although, as mentioned earlier, portable player prices tend to differ by very little—virtually all carry a suggested list price between \$300 and \$400—what is included in the price can vary substantially from one model to another. The Sony D5, for example, the first portable CD player

on the market, is now packaged with an AC adapter/battery charger, battery, headphones, phono plugs, patch cord and shoulder strap as the D5-SPL at a suggested list of \$279.95. The player alone has been sold for under \$100, however.

While most players include at least an AC power supply and patch cord, many offer batteries and carrying cases separately. If you do not plan to use the player outdoors, the extra expense of DC power may not be necessary; on the other hand, this extra capability may prove handy at some time in the future, even if it seems unnecessary now.

Another area where there is some differentiation between models is in the laser pickup. The field is divided between one- and three-beam lasers. The advantage of the latter is that it may be more facile at tracking damaged or dirty discs. The advantage of one beam is that the player is smaller. If you already own a scratched or marred disc, test it on both single- and triple-beam machines.

If you do not own such a disc, you can make a test disc by cutting a triangle of Scotch tape and sticking it on the disc (with the sharpest point inwards). As the disc plays, more and more of the tape will interfere with the laser beam. The better players will go longer before the clicking, skipping, and locking problems begin. If a player seems to be doing an amazing job of tracking your test disc, seeming to read right through the tape, be sure to check that the tape hasn't fallen off.

## Operating Features

Operating features, as mentioned earlier, are remarkably similar from one player to another, making minor differences that much more significant. Try out all the controls, however, to see if they are easy to use. Some players use a few buttons for many functions, which can be confusing, while others have a lot of confusing buttons, but each button does only one simple thing. Here is a round-up of standard—and nonstandard—features.

Obviously, certain transport functions are essential to player operation: **play** and **stop** being the absolute minimum required. All players now on the market add a **pause** control, **skip forward**, **skip back**, **fast forward**, and **fast reverse**.

In addition to the latter, virtually all manufacturers offer player **programmability**. The shortest memory of the current crop of players is 10

tracks, the norm is about 15 and the maximum is 18 (the Technics SL-XP5 and SL-XP8). In most players, programming is accomplished by repeatedly pushing the forward or backward skip/search button until the desired track number appears on the display. You then press a **memory** or **enter** button. The Technics SL-XP8 and Panasonic SL-NP20, both of which feature a built-in AM/FM tuner, have a 10-button keypad used for both entering track numbers and selecting radio station presets.

The LCD on all players displays, at least, the current track being played and elapsed track time. Many units will, at the push of a button, also show remaining time and tracks on the disc and battery status. The Technics and Panasonic models just mentioned, as well as the JVC XL-R10K (which is virtually identical to the SL-XP5), also display up to the first 15 of the tracks chosen for programmed play.

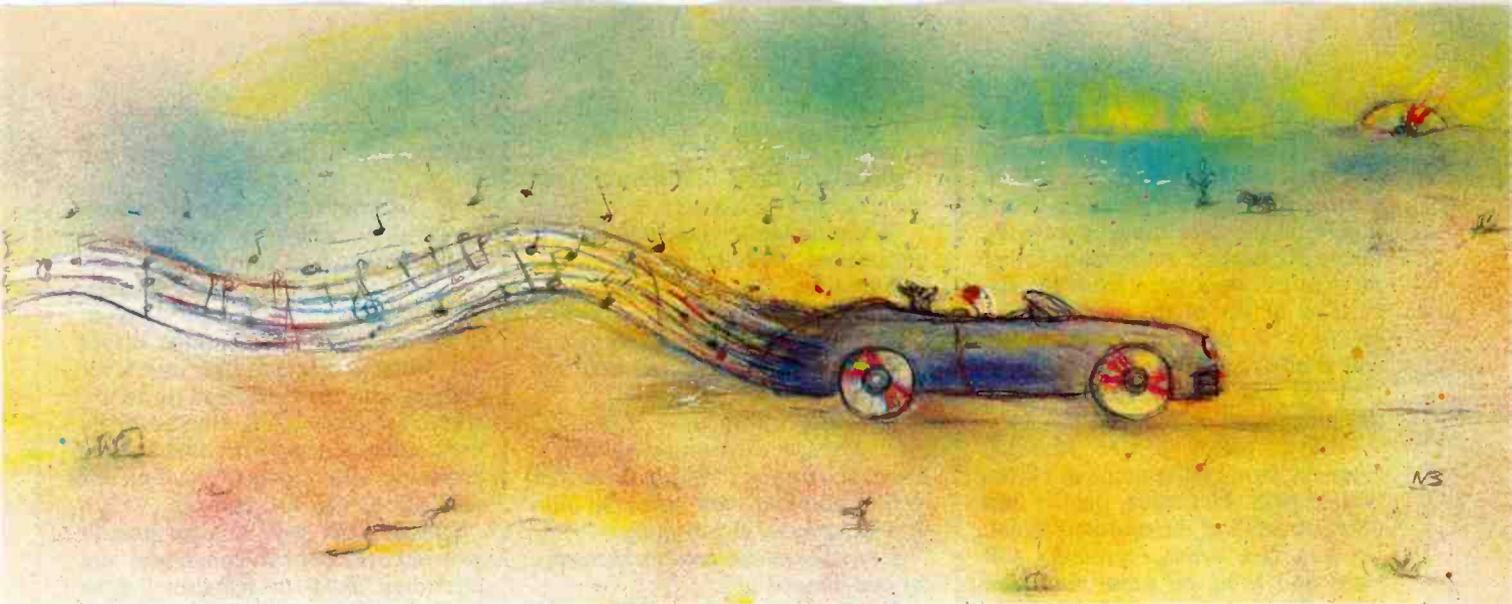
Another feature common to many players is **auto-repeat**. In most cases, either an entire disc, one track, or a group of tracks can be programmed to play repeatedly. Some players can perform two repeat methods, and Sony's D-7S, D-55 and D-77 can perform all three types of repeat.

As mentioned earlier, all players include three jacks: headphone out, line out and DC in. Likewise, every unit features a level control for the headphone jack, but none for the line-out circuit. If you like listening with a friend, the Sanyo CP10 and the Citizen portable have jacks for connecting two pairs of headphones.

Two companies—Hitachi and Sony—offer players equipped with some unusual playback functions. Hitachi's DA-P100, which is about the size and shape of a paperback book and is one of the few players to include an internal battery compartment and exclude programming capability, features **Scan-and-Play**. When activated (by pushing a button), the first 10 seconds of each track are played until the play button is pushed (which will discontinue the scan mode and cause the unit to go into the play mode) or the entire disc has been scanned.

Sony's three new models (the D-7S, D-55 and D-77) all offer a mode called "shuffle play." This feature electronically shuffles the track sequence and plays all the tracks on the disc in random order. It will,

(continued on page 41)



# CD OPTIONS

## FOR THE CAR

In dash? Under dash? On the front seat? Or in the trunk?

by Christopher Greenleaf

**W**hen you add digital audio to your on-the-road listening, the options open to you far outnumber the alternatives you have at home. The only real obstacle is the limited amount of space available for mounting a player in the car. There are far more ways of adding a CD player to your autosound system than you may realize, though, and many of them are relatively affordable.

As we look at the ways in which a CD player can become part of your mobile sound environment, we'll explore every aspect of what you need to consider as you take the digital plunge. We'll touch on the eight ways you can have a player in your car and the attendant mounting options, disc playing options, buying a car with the maker's own CD player and sound system, compatibility, expandability of the whole system, and the few necessary specifications.

As a possible installation date draws nigh, it is essential to devote some thought to how you feel about cassettes and Compact Discs in the car, because your choice of options and how you fit things into your

dashboard depend on this crucial question.

### *The CD vs. the Cassette*

All further decisions are affected by the question, *Will I want a CD player and a cassette player, or do I plan to listen only to CDs?* That's not a trivial question, and how you answer it will decide the present and future installation options open to you. The answer will also determine the formats in which you buy recordings and what freedom you have to custom-prepare music programming for mobile listening.

A few bright souls I've talked to smugly boast that they now listen only to CDs on the road. ("Cassettes? . . . come on, man!") Most listeners I've talked to, though, want to either add a tuner/CD player to their existing power and speaker complements and keep cassette playing capability built in, or find some other way to be able to take advantage of their tape libraries while they drive. There are several reasons why many music lovers want to keep cassette players when they add a CD player:

-CDs still cost around \$15 each, while high-quality cassettes from most labels run about \$5 to \$11 each. If you record your own music onto blank tape, you can get hold of good C-60s and C-90s for as little as a couple of bucks each.

-Tape play of up to one and one-half hours, uninterrupted, is possible with the new and increasingly common auto-reverse decks. The play can also be endless, in some models, and there are numerous programming features to extend variety and program shaping.

-Only the standard audio cassette now makes it possible to inexpensively customize home recordings of repertoire combinations commercially unavailable. (Digital audio tape—DAT—may change that in the future; more on that later.)

-In all categories, the repertoire of the digital Compact Disc has been growing quickly, but nine decades of recorded music—our major musical heritage—are available in their entirety on LP and cassette, and can be played in the car only on tape or via random broadcasts.

Then there's the negative side of

the cassette:

-Degradation of the micro-thin coating of magnetic particles on its fragile plastic membrane eventually forces a cassette's retirement. Other mechanical woes stem from the decreasing ability of the tape's self-lubrication to prevent scrape flutter and chatter across the tape heads. A very old tape will eventually squeal like an enraged chipmunk.

-The durability of the recorded magnetic signal on the tape is a function of both the coating quality and of the strength of the recorded signal. Unclean tape heads eventually dull highs and bring on noise reduction mistracking.

-Access time during music search can run from several seconds to well over a minute. With classical music or other signals with frequent, prolonged, low-level signals throughout the tape, it is physically impossible for these sensors to locate the end or start of a quiet track. Even more irritatingly, music sensors typically treat mid-movement quiet sections as inter-track silences and stop the tape there.

-Cassette audio quality varies enormously. So does the degree of success with which tape heads, transports, and noise reduction confront different tapes. Only costly decks can adjust for tape vagaries and optimize tape transport as needed.

And how does the CD stack up? On the positive side:

-Durability, for generations.

-Instant access in as little as a second to any part of the disc.

-No noise reduction or tape equal-

ization to fidget with.

-Booklets more informative than the cassette J-card insert.

-Wider dynamic range and cleaner, undistorted peaks (if your front end and amp are up to the signal!).

-Up to 74 minutes playing time.

OK, now votes against:

-Cost: \$15 on average and not dropping as quickly promised.

-Actual playing time. Classical discs average fifty minutes, with a few over seventy; I've seen three CDs in rock and jazz with under 30 minutes on each . . . at full price.

-Jewel boxes can prove a challenge for one-handed use.

-You can't record on CDs (yet), which limits you to commercial releases in the stores.

Stack up these points as you evaluate your needs. This is certainly not an exhaustive list, as it hits only some of the more obvious qualities of each format, but it should give you some basis for deciding. Your prime factor in this decision will still be "Can I count on the Compact Disc (and radio) to provide all my music, or would I want and miss the broad selection available on cassettes?"

### All the Options

There are eight ways to play CDs in your car. They range in price from quite inexpensive to staggeringly costly, depending on your degree of customization and how elaborate a system results. What you choose to do can even have a direct bearing on how you configure your home Compact Disc equipment. Roughly in order of escalating equipment and in-

stallation cost, here's what you can do.

**1) Adapter for a portable player:** Several companies make small adapters that plug into either a line-out jack or a headphone jack (usually the former— and provide a signal to a conventional receiver tape player via either a cassette-like insert for contact with the type head or an antenna interconnection. One normally uses either the player's own battery powering or an adapter for the car's nominal 12-volt DC current.

**2) CD/AUX jack in head unit:** A growing number of companies are providing front- or rear-panel jacks labeled CD or AUX (auxiliary). These effect a direct electrical connection that usually matches the impedance needs of the two components. A few car stereo companies have also thoughtfully begun to introduce powering leads for portables, making them less battery-dependent.

**3) Add-on CD player:** Using a conventional head unit's AUX/CD input, a CD player (without tuner) can be permanently or semi-permanently mounted under the dash, in the glove compartment, or elsewhere. Slow sales of player-only models have reduced the number of them available from major companies, but they should continue to be available in a number of models.

**4) In-dash tuner/CD player without tape:** This is the obvious option if you decide that dashboard real estate and your listening preferences make it unlikely that you want a cassette player again. (I'm assuming that you will not want to do without the rich and random variety of radio and that you will want a means of listening to weather, news, traffic, emergency announcements, and other useful programming on AM and FM. The arrival of FMX FM stereo noise reduction—in cars by mid-1987, I believe—will also make radio more sonically attractive than in the past.)

**5) In-dash tuner/CD player with AUX jack for cassette portable:** Banishing the cassette player from your dash need not sentence you to a life on the road without tape. Using a front- or rear-panel auxiliary jack, you can play a personal portable tape machine through your full autosound system.

**6) Docking CD player or tape player:** With one or the other unit permanently installed in the normal dash location (or in a console), you can have one of the several competing brands of removable chassis fitted to any head unit and slip it in when you want to use it. One company (Phil-



... it was really quite bizarre. Elaine. Business was very bad and in a fit of depression, he attempted suicide by swallowing a bottle of stylus cleaner—well, he survived all right, but here's the strange part,—from that day on his lisp was gone!"



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**AUDIO SYSTEMS**

ips) already makes such a CD player, which doubles as a personal portable. Perhaps some smart engineer will use the same docking format to permit alternate use of otherwise identical CD and tape players in the same dash opening . . .

**7) Two in-dash or console head units combining CD, tape, and radio:** Such an installation is possible only if you have the room or can contemplate a custom adaptation of your car's aesthetics. Depending on your taste, the results look stunning or cluttered. It is the simplest way to have it all and have it permanently a part of the car. If it is installed by an expert, it also assures complete inter-component compatibility. . . . not a bad idea.

**8) Trunk-mounted systems:** As you may have heard, you don't have to have everything in or near the dash anymore. The new trunk location for which some systems are designed expands your possibilities enormously. Sony has a ten-CD changer with an optional tuner pack. Alpine has a six-cassette changer. Both are linked by an umbilicus to a passenger compartment control unit. Alpine has announced a CD changer for its line, too, and it will be incompatible with the Sony and with other systems just being announced. The magazines each player utilizes are compact, protect the discs, and fit home changers coming onto the market. You might end up with the same format of player at home and in the car.

### *Pros & Cons*

Some prose about the cons of the above options is in order. The portables, unless they are docking models that slip into holders wired into the system, will be loose on the seat, in your lap, or wherever they happen to fit best. Sudden braking and bouncing can send them flying. That can cost you medical, electrical, or aesthetic consequences of one sort or another. Most portables (CD and cassette) are not as immune to a car's peculiar motion and vibrations as the in-dash units designed to cope with them.

Customizing is costly, but it can solve many of the problems inherent in having two head units, especially if both must be either permanently mounted or removable from permanent housings. Like the portables, the docking units solve their security problems simply. (I guess that means that either *you* remove them or someone *else* does.)

The disadvantage, and perhaps the only major objection I can raise, to

trunk-mounted systems is, at the moment, their cost. That will come down as optical linkages and new remote technologies become widely available and competitive. For now, such an installation will start above \$1,000 (components and labor) and move on up into the higher regions. On the positive side, the increased size of trunk components means greater vibration and shock isolation. Their proximity to a trunk-mounted power amplification package decreases certain installation costs and noticeably lowers hum intrusion into the wiring scheme. The sophistication of the remote commanders that come with hidden components is remarkable, and the bigger display screens possible without a cassette or Compact Disc by eating up space are welcome to detail-weary eyes. Assuming use of a CD changer, you should be able to drive from either the east or west coast to somewhere in the middle of the country before you get bored with the selection!

In addition to the proprietary (and therefore incompatible) changer magazines, there are individual CD cartridges. To avoid having to load discs from a difficult-to-open jewel box, you pre-load them into the tiny cartridges, which shield them from greasy fingers and sharp objects and open a flap for the player's laser optics to scan the rotating disc. Unfortunately, you *must* use a cartridge in any player designed to take one. This format war will be unlikely to take on the epic proportions (and needless hype) of the standard and mini video cassette formats, but it can confuse the issue a bit. My question is, how much extra shelf space do you need to store the jewel boxes with their booklets *and* the labelless cartridges? Also, do you have to buy a lot of cartridges and reload the whole collection, or will most users load just the few discs they plan to take for a drive on a given day, rotating them in and out of the carts?

### *Buying OEM*

Buying a stereo system with the car as you signed for the whole package on the sales floor used to be a fine way to get some so-so sound. That's changed for the better, to the chagrin of the aftermarket manufacturers. Not long ago, good electronic tuners and noise reduction hit the OEM head units. Then came respectable amplification and speakers. Finally, some extraordinarily well-engineered speaker mountings and enclosures from big American and Japanese automakers began to put genuine au-

*dio* (as opposed to mid-fi) into the showrooms.

Now, one maker (Ford) has been shipping Compact Disc players in certain models and others have announced the names and dates of models in which the players will be offered as options. The funny thing is, some of the makers who are howling the loudest about the car companies' inroads into aftermarket autosound are the ones the biggies have chosen to manufacture their players.

### *Compatibility*

Most CD players for automotive installation come with the world-standard RCA phono plugs familiar in home audio and most car audio. These are used for signal output from the players. In a few cases, proprietary jacks and plugs encourage you to buy all your components from one company to keep it all compatible and easy to connect. Some companies make adapters for their noncompatible plugs . . . but double check before spending any money.

Powering leads are pretty much color coded in the usual way. There are not really any standard plugs and jacks for this, except to permit removal of the head unit from the rest of the wiring harness, so don't worry about compatibility here.

Reasonable standardization of in-dash openings and mounting depths exists, *but check this aspect of a player carefully*. Most models are DIN or so-called new-DIN in size, and there are exceptions for the various car makers' deviations from the norm. It is very important that there be sufficient depth to fit the player and good point at which to affix a rear support strap, to keep the unit from bouncing unduly.

Many players are intended to be mounted no more than 15° away from the horizontal. Though you may have to hunt a bit, see if you can find reference to this crucial detail if you must place the player at an angle exceeding this, as its performance can be severely curtailed and the life of the optic tracking servos shortened.

### *Expandability*

We need only say, on this subject, that your foresight in choosing components will determine how easily and how cost-effectively you are able, at a later date, to update your sound system. As you dream your, we hope, realistic dreams of sounds yet unborn and LEDs yet unlit, match what you contemplate buying with its ability to accept additions to the system. As the

saying goes, think ahead.

### Performance by Numbers

Players do and do not sound alike, depending on whose reviews and editorials you've seen. Don't expect to judge players by the sort of specifications used for turntables, speakers, and cassette decks, because the same criteria simply don't apply to digital audio components. Standardized yardsticks for virtually every audio element exist, but they have taken years to formulate and refine. The CD player, which isn't yet four years old in this land, does not benefit from a codified set of standards by which to judge it.

However, three specs do exist in a way that is useful. *Channel separation* of greater than 90 dB is excellent and guarantees minimal interference between the left and right stereo channels. *Intermodulation distortion* (IM) involves the intrusion of spurious harmonics and other frequencies into the musical bandwidth. A very good IM figure is .003% or less. Phasing involves the relationship in time that exists between very high frequencies and the rest of the lower bandwidth of music. If such a figure is given, a *phase linearity* of less than 5° at 20 kHz (the top musical frequency normally given) is excellent. Even so, substantially higher figures do not necessarily disqualify a player used in the potentially noisy environment of a car, where many a finer musical point never gets across.

### The Digital Future

... bids fair to include the CD for a long while. At some time in 1987, the first consumer digital recording medium, digital audio tape with a rotary tape head (R-DAT) will be debuting. Commercial and home-made tapes will be possible, just as with the conventional, analog cassette. Whereas the CD can be added to the cassette as a car stereo and home audio format, the R-DAT format is intended to replace the humble audio cassette we know today. Its 16-bit digital sound and two to three hours of play on the R-DAT's one side make it a hot item. It could well supplant the analog compact cassette in time. For now, though, the cassette we grew up with offers extremely good sound and load-your-own convenience that are a perfect match for the audio perfection of the CD.

Make your choice about a car CD player wisely, including or excluding the cassette player as you see fit. Each has its advantages and its drawbacks. Whatever your choice, let the winner be your music. □

(continued from page 36)

however, repeat tracks before all have been played.

This summer, the first portable Compact Disc/radio tuners appeared. Panasonic/Technics unveiled the SL-NP20 and SL-XP8, and Sony showed the D55 and D77. All units (except the D-55, which tunes only FM), receive both AM and FM. Sony uses a conventional dial scale with slide-rule tuning, while the Panasonic/Technics models feature a digital tuning display, electronic tuning and 16 station (eight AM, eight FM) presets.

Although JVC and Pioneer offer players that can be slid in and out of special compartments on portable component systems and a number of manufacturers make portable component systems that include a nonremovable CD player, most such units are incapable of reproducing the high-quality CD output as authoritatively as home systems. They may be worth considering for use in a vacation home or college dorm room. Another option for a secondary system is a portable CD player connected directly to a pair of powered speakers, such as AR's Powered Partners or the Bose RoomMates. The headphone level control can adjust speaker volume.

### Convenience

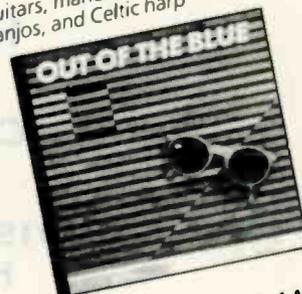
Perhaps one of the last things to look at in a portable Compact Disc player is the layout of its controls. If the device is to be used solely at home as part of a complete system, this consideration will probably be relatively minor—unless controls are scattered about all six surfaces of the player. However, when carrying a unit outdoors, a cluster of controls on one easily accessible surface takes on a much greater convenience. Likewise, carrying cases should not make access to controls a matter of unbuckling, unzipping or unwrapping: the important functions should be grouped together in a place that's easy to reach.

In conclusion, the selection of a portable CD player is an enterprise limited by a remarkable degree of uniformity among current offerings. Although differences between models are occasionally subtle, they are, nevertheless, there. The tests described here should help in furthering these distinctions. And, as with any piece of audio equipment, a thorough test drive and careful listening is the best assurance of continuing satisfaction. □

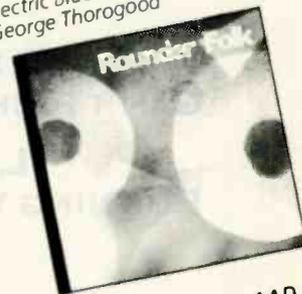
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## MUSIC FOR THE MIRACLE

AVAILABLE WHEREVER RECORDS AND CASSETTES ARE SOLD. © 1986 CBS INC.

# COMPACT DISC ACCESSORIES

by Marcia Golden

In the beginning, there was the Compact Disc player. It was touted as the perfect sound machine and its software was reported to be virtually indestructible.

We saw it and judged it good. So we bought a player and we bought the discs. And bought. And bought. And then we wondered, "Where will we ever store all of our purchases?" And so the CD accessory industry was born, trying to fill a much-needed void.

Caught up in the romance, the sound, and the technology of the Compact Disc revolution, many of us reshuffled existing componentry to include the new and increasingly compact CD hardware. And, too, we pushed aside substantial LP record collections to include an ever-growing

collection of the doughnut-sized silver discs.

Devotees of the rituals of vinyl record maintenance and engrossed in our pursuit of perfect sound reproduction, we religiously sought and continue to seek out the appropriate CD accessories necessary to store, maintain and enhance our new systems' and software's performance.

In response to that demand, manufacturers have steadily introduced a number of CD-related products to complement the category. Chief among these are storage systems (designed to organize CD collections at home or on the road) and disc cleaners. In lesser numbers are the electronic enhancers to correct, mellow, or modify supposed aesthetic imperfections in a CD player's sonic performance.

HALLEY GANGES



Still, the current crop of CD accessories is plentiful enough to stir the heart of even the sternest audiophile. And what follows is a brief overview of many of the new products now on the market.

### *CD Storage*

From the single-CD plastic replacement case or "jewel box," to the 200-plus, hardwood disc organizer, there are dozens of storage systems available in every price range. Most are a variation (in size and material) of box storage. Several double as dual-purpose CD/floppy computer disk holders. And a few, like the Geneva Group's \$7.99 CD Storage Album (designed to store four CDs with jewel box holders in the space of a standard LP record album) or the Nagaoka spring-loaded, open storage system available from Angstrom Associates, offer some interesting design variations. The Nagaoka CD Flexi Keeper (\$14.95) stores up to 15 CDs upright. It also doubles as an audio/video cassette holder. (Angstrom also markets Nagaoka's CD Protective Sleeves—\$9.95 for a pack of 25—and its own CD Safe-T-Case, \$4.95 per three-jewel-box pack.) The cases are 35 percent thinner than traditional jewel boxes and feature a soft, polypropylene bottom, grooved so that dust and particles settle away from the stored disc's surface. They are hinged so the disc pops up for easy loading. The Nagaoka Sleeves are designed to reduce fingerprints, dust buildup and prevent scratches on discs.

Also of note, by virtue of its non-box-like design, is Discwasher's 20-disc CD Storage System (\$19.95.) Designed for the home or the car, it resembles a flat Rolodex-like card file and measures 6 inches × 15 inches × 2 inches. The System features a special storage clip so users can pivot the discs forward to scan titles easily.

And if volume is a virtue, then Ray-Line's tabletop Compact Disc Carousels pack a considerable wallop. Available in two models, both the DMD-200L and the DMD-200B hold 200 CDs and their jewel boxes. Both are equipped with two rows of 25 shelves, supporting two discs per shelf. Constructed of rugged, interlocking, one-piece mitre-fold cabinetry and finished in a walnut-vinyl laminate, the entire unit is mounted on a heavy duty swivel base with mar-resistant feet. Model DMD-200L is fully secured with two transparent doors fitted with "matched key" locks. Model DMD-200B is open on both sides for instant

access, desirable in broadcast or disco situations.

In selecting a unit drawn from the general population of box storage systems—by far the largest category—let budget, aesthetics, and space be your buying guide. The listing below is but a sampling of systems now on the market.

Individual CD storage cases, or jewel boxes, have long been available to replace a disc's original worn or cracked packaging. Replacement jewel boxes are nearly identical to CD originals, featuring a black plastic back and a clear plastic cover. Packaged in most cases as singles or multiples, those marketed by Alpha Enterprises, Inc., a Canton, Ohio-based accessory supplier, also include self-adhesive spine labels to make it easy to identify discs even when stored in the generic CD organizers. Alpha also markets a ribbed black plastic Compact Disc Organizer that stores 12 singles or ten plus one double CD albums. Designed to sit on a shelf or mount on a wall, the Alpha Organizer features easy-interlocking side, top and bottom tracks for convenient horizontal or vertical disc storage.

From the Bay Pacific Trading Co. of San Francisco come two Wittner CD storage products. One, the CD Tower (\$9.95 each), was originally designed as a modular system for retail outlets and is now generally available. Each wall-mountable or stackable Tower stores 200 CDs flat, to make it easier to read the titles on the jewel box spine. Connect four CD Towers and they hold 80 discs in less than a cubic foot of space.

Innovative Concepts, San Jose, California, sells two black plastic CD storage boxes under the brand name "Flip 'N' Play Compact Disc Files." Available in units that hold ten or 18 CDs each (\$4.95 and \$9.95 per unit respectively), each stacks side by side or vertically. The CD 18 File features a "touch-release" mechanism to securely lock in or quickly release individual discs.

In an technological double play, Lebo Peerless dual-purpose Compact Disc/Floppy Disk Cabinet (Model 54240) holds either 40 CDs or 120 floppy disks. The walnut-grain finished plywood cabinet measures 13 inches x 12 inches x 6 1/2 inches. Finished on all sides so there are no rough edges, the two-drawer unit holds 20 CDs in individual compartments. Stackable, it is equipped with rubber feet to protect all surfaces. Also from Lebo is a Compact Disc Home Storage Unit (Model 54224). It holds up to 24 CDs horizontally

and is hand crafted in solid wood with a natural or walnut finish.

Royal Sound has expanded its Add 'n Stac storage line to include a dual-purpose, black plastic CD/floppy disc organizer. Designed to store 12 CDs in standard jewel boxes or 18 CDs in the new "Slim" cases, the CD Add 'n Stac also accommodates 5 1/4-inch floppy disks. The company also manufactures a three-drawer, 90-disc storage system. The CDD90 has four nonskid feet, and is sturdy enough to support a CD player or to stack conventionally.

Usable as either a free-standing or wall-mounted storage system, Sound Accessories Compact Disc Organizer (CDDS-1) holds either six double or 12 single CDs in their jewel boxes. Made of smoke-colored plastic, the Organizer interlocks horizontally and vertically for easy-convenient expansion.

A new company in the accessory arena, Creative Point of Fremont, CA, has recently introduced a family of CD cartridge files called Laserline. Made of impact-resistant plastic, the new line consists of the 24-disc CD-2400 (\$29.95); the CD-1200 (\$19.95), which holds twelve CDs and the eight-disc CD-800 (\$9.95). Each modular member features the company's Securing-Release Mechanism (SRM). One touch of the SRM releases the disc for easy access.

Wedding furniture to function, the CA-DASS division of American Recorder Technology has introduced a solid oak Compact Disc Storage Cabinet, the SC-1200. It features two slotted drawers that hold 28 Compact Discs each. The hand-oiled natural oak version has a suggested retail price of \$129.95. Walnut and black lacquer finishes are also available.

The Dynasound Organizer Division of Hartzell markets two CD Cases: the CD40, holding 40 discs, and the CD12, which stores twelve. The division also markets a deluxe Compact Disc Cabinet (Model CD40WD), which holds either 40 CDs or 80 5 1/4-inch diskettes. The solid wood, single-drawer unit features individual compartments, and stands on rubber feet.

EID Center's two CD storage cabinets are manufactured and imported from Bangkok, Thailand. Both the new, 60-disc roll-top cabinet (available only since September) and a 36-CD unit are hand-crafted of teak and finished in teak oil.

### *CD Storage-To-Go*

With four models for moving CDs, Case Logic appears to have the cate-

gory well covered. From the Model CD-8 (\$7.50) to the 30-disc Model PSCD-30 (\$29.95), with its handy pocket to hold a portable player and the CDs, each case is constructed of rugged nylon, backed with protective foam padding.

Coast Manufacturing has recently added a 15-disc Compact Disc Organizer to its line of Coaster Red Accent portable storage products. Insulated against heat or cold, the Organizer holds discs securely in a rattle-free, die-cut rubberized cushion. A two-way zipper on three sides provides fast, one-hand access.

Straddling the line between photographic and sonic is Kiwi's Compact City Bag (Model CB107, \$64.95). Whether it's used to tote a portable CD player and discs, or a photo camera/mini video camera or camcorder, the bag features a main padded compartment with Velcro padded partitions, a removable base lined with Cellular Armor for shock protection and a full-length, zippered pocket in both the front flap and on the back.

In addition to its home storage units, Sound Accessories markets a 15-disc CD carrier. The CD-15 is equipped with a heavy plastic handle for briefcase-like portability. A clear plastic window enables users to scan disc titles easily.

### Cleaning

One could ask why it is that Compact Discs, once promoted as virtually indestructible, are now suddenly the target of cleaning marketing campaigns conducted by record care product manufacturers—each promoting its unique cleaning method?

Have CDs suddenly become more vulnerable to wear or tear? Or are we now the victims of evil merchandising and marketing campaigns?

CDs are still the same tough little recording media they were when introduced. While they should always be handled with care, they are still tougher than traditional vinyl records. One cannot, after all, drag a razor across a CD's surface and expect it to play without problems.

CD players, however, are much more sensitive. So it is for the players, it seems, that one must clean the discs

According to cleaner manufacturers, small patches or particles of dust, oil, and dirt on a disc may reduce the laser's ability to read through to the music encoded and embedded below the disc's surface (particularly, they say, players using lasers less powerful than those of the original high-end

models). The result, they report, can be audio dropouts, skips, or a distorted signal.

While most consumers exercise reasonable caution in the care and handling of their CDs, it is probably a good preventive measure to keep the discs clean. As dust particles carried into a computer's disc drive can "gum up the works", so dust deposited into a Compact Disc player when a disc is inserted could possibly "gum up" the delicate mechanism

Eschewing soap and water, or the handy t-shirt, there are a number of commercial cleaners being aimed at the CD market.

Quite possibly the smallest is Geneva's Model PF-410 Cleaner (\$7.99). It consists of 18 individual pre-moistened, high-density foam pads and a burnisher mounted on the back of a CD holder which is the same size as a CD jewel box. Each pad reportedly cleans at least five CDs.

The most complex CD cleaning system is Nitty Gritty's Model CDI Cleaner (\$159). Promoted as "the only self-propelled CD cleaner in the world," users simply apply the kit's cleaning fluid to the disc, activate the system's motor, and lower the buffing pad affixed to the dust cover. Cleaning takes 30 seconds.

In between these extremes are a number straightforward cleaning systems.

Last Factory's System Formula 6 CD Protection System (\$14.95) is a soup-to-nuts disc cleaning and treatment system that also features a supply of ten Digi-Last Shields. The shields are designed to adhere to the label side of the CD surface to protect it against bumps and scratches.

Calibron has recently introduced two new CD cleaners under its Clean Mate label. The first cleaner kit, Model CD-400 (\$7.99) is for manual cleaning of Compact Discs. A deluxe kit, the Model CD-405 (\$12.99) includes a measured pump spray bottle, a nonabrasive cleaning pad, a dust-free storage case and complete step-by-step instructions.

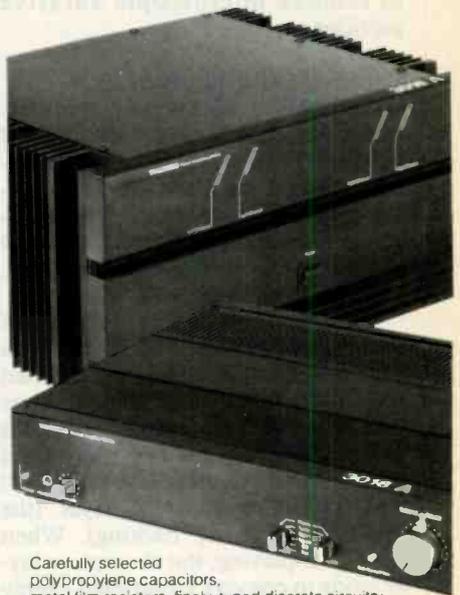
Angstrom Associates USA is distributing Nagaoka's CD-1100K Radial CD Cleaning System (\$11.95Z). Packaged with a plastic flip-top case, which provides a stable work platform for cleaning, the CD-100K also features a spray that acts as a surface lubricant, forming a buffer between dirt particles and the disc surface. A lamb's leather cleaning pad is designed to lift dirt particles from the fluid layer.

Other radial systems include Discwasher's CD Cleaner (\$19.95)

and the Alpha Model CDC (\$8.95). The Discwasher cleaner uses a cleaning fluid which is sprayed directly onto the CD, and a cleaning surface which rotates on the disc in the cleaning unit when a muscular arm turns the crank. Alpha's is no larger than a CD jewel box. Fingertip pressure provides the cleaning momentum.

The Allsop 3 Compact Disc cleaner is designed to sweep its nonabrasive fibers perpendicularly to the

## AMPLIFICATION FOR THE CONNOISSEUR



Carefully selected polypropylene capacitors, metal film resistors, finely-tuned discrete circuitry and zero-feedback design... are some of the design aspects that take Tandberg's equipment out of the mainstream and place it in the world of the audio connoisseur.

Tandberg now establishes the reference for sonic clarity, openness and overall musicality with the TPA 3016A Power Amplifier and the TCA 3018A Preamplifier. Never before has the selection of quality components, complete absence of IC's, high current capability and elimination of signal degrading negative feedback design been executed with such dramatic results.

The high-current, dual-mono MOSFET amplifier, rated at 220 watts per channel with no more than 0.05% total harmonic or IM distortion, and peak power capability of 1,500 watts into 0.5 ohms, confirms the TPA 3016A Power Amplifier's extraordinary ability to handle a wide range and variety of low impedance speakers. An engineer, heating up load resistors at his test bench, will be quite satisfied... as would a professional musician listening to the reproduction of music.

A newly-developed moving coil input stage that sets new standards for musicality, clarity and low noise, with both the MC and MM inputs fed into a passive RIAA network that truly demonstrates the advantages of zero feedback design, makes the TCA 3018A "direct-path" Preamplifier the perfect complement to the TPA 3016A Power Amplifier.

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CIRCLE NO. 60 ON READER SERVICE CARD

signal path to any reduce sequential loss of data.

The AT6030 CD Cleanica from Audio-Technica is a dry cleaning system. The disc is placed, label side down, on the system's turntable. A hinged, transparent dust cover is closed and a slide lever on the cover's top is moved back and fourth. Each movement moves the disc around and is repeated until the disc makes a complete revolution. As it revolves, it comes into contact with the kit's cleaning pad.

Amaray International Corp.'s Tracmate Compact Disc Cleaning System (\$17.95-\$19.95) relies on replaceable, ultra-fine-bristled brushes to remove microscopic abrasive particles.

### *Sonic Enhancement*

Currently a number of manufacturers are distributing variations of CD mats designed to stabilize, dampen, or reduce the disc's vibration during play. Three, mentioned here, include Sumikio's Counterparts CD Mat, The Discus by Monster Cable, and the Mod Squad's CD Damper.

The operative principle of Sumiko's Counterparts (\$10 for a package of ten) is called "constrained layer damping." An absorptive layer (the adhesive in Sumiko's product) is sandwiched between two more rigid layers—on a vibrating layer (the CD) and one a constraining layer (the mat's clear plastic backing). When the CD is playing, the absorptive layer tends to convert vibrational energy into a small amount of heat. Because the CD's vibration is reduced, the need for constant servo operation and, simultaneously, constant corrections of "soft" error is reduced. The benefit to the listener is supposedly that the music may sound less harsh, less artificial, and more natural.

Monster Cable's The Discus high-energy disk for CD players is a precision-machined disc-stabilizing device designed to damp out CD vibrations, minimize laser diffraction, and stabilize the rotational speed. It reportedly allows CD players to read more of the music signal accurately, thereby requiring less error correction. The Discus can reduce mistracking of damaged CDs. A new Discus+ version of The Discus is thinner than the original, so it may be used in players where thickness may be a problem. It is, however, heavier than The Discus, so player compatibility needs to be checked. The company can provide you with a list of compatible players.

In addition to its own Compact

Disc Damper, the Mod Squad also markets a Compact Disc Accessory Package and a Line Drive system control center designed to replace conventional preamplifiers in directing such line-level components as CD players. The Damper is a flat plate that is placed over the disc during play. It reportedly suppresses edge flutter, eliminates light leakage, reduces digital readout errors, and decreases power-supply load. Each Damper is packaged with 15 adhesive rings (\$25; Disc Damper Centering rings, \$5 for 25, \$90 for 500 rings and \$170 for 1,000). One ring is centered on each disc. The disc is then placed in the player and the Damper is loaded on top. Mod Squad's CD Damper is not suitable for portable players or for those which have a pop-up toaster-type loading system.

The company's Linear Drive supposedly sidesteps the input overload problems some preamplifiers may have when used with CD players. It features five line inputs, input selector switch, tape monitor, mute, balance control, and volume control. Available in two models, one is completely passive (\$350), contains no active components and adds no gain to the signal. It is successful with most systems. The other model switches between the passive and active mode. This new model (\$500) is appropriate if the interconnect cables to your system's amplifier or crossover are more than eight feet long or if one of your line-level sources has lower than usual output.

Mod Squad's Compact Disc Accessory incorporates four distinct elements: three Mod Squad Tiptoes, a Mod Squad CD Damper, a VPI Magic Brick and an Audioquest FMS Blue II Cable. Purchased together, the kit retails for \$165. If purchased separately, the whole would cost \$186. Mod Squad Tiptoes are specially matched aluminum cones, which are installed point down to make platforms for a CD player. They mass-couple the component to the surface beneath it so the pressure per square inch on the tiny point is enormous. Components supposedly become linked to the surface as solidly as if they had far higher mass. The VPI Magic Brick is a little wooden box which encloses a dense, high-grade steel core. When put on top of the chassis enclosure of a preamp, head amp, or power amp it reportedly adds sonic clarity to a signal. The Audioquest FMS Blue Interconnect is a transparent, detailed wire.

Little attention is being paid, as yet, to the car Compact Disc accesso-

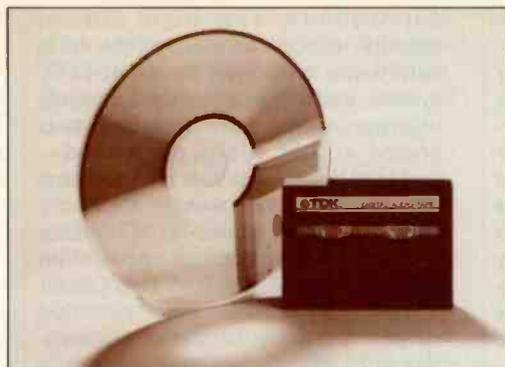
ry market. Parasound, however, has been selling a CDS-1 Compact Disc/Tape Switcher (\$29.95) for some time. An under-dash device, the Switcher is designed for any portable player. Measuring one inch high, the CDS-1 allows for switching via an illuminated, two-color front-panel input selector. Its front panel also incorporates a 9V DC jack for powering the player. An illuminated slide control for level adjustment is located on a side panel. In addition to an existing radio/tape player, the installation must also include a separate amplifier or booster/equalizer.

Recoton is also selling a new CD-20 player/cassette adapter (\$24.95). Designed by Larry Schotz, it plays portable CDs through any existing front-load or side-load cassette sound system. The CD-20 consists of a conventional audio cassette shell housing proprietary Schotz electronics. Out of the shell extrudes a flexible cord which ends in a stereo mini plug. To operate, simply plug the cord into the player, load the adapter into the cassette slot and turn the audio system on.

Both Esoteric Audio and Monster Cable manufacture interconnect cables specifically for Compact Disc players. The Esoteric Air Litz Technology 2 features, according to the manufacturer, a high-definition, 150-strand pure SHC litz signal path, an ultimate Air Braid dielectric, optimum space efficiency, matched conductivity between the primary and shield conductor, and extremely good shielding properties. A one-foot-pair of connectors retails for \$40; a two-foot-pair, for \$44; up to a 10-foot-pair, which sells for \$84. Custom lengths available upon request.

Monster Cable's Interlink CD "Super high resolution" CD player interconnecting cable is designed to compensate for the transient and phase distortions of the digital process, while minimizing some of the "harshness" found in some CD program material.

There are many CD accessories available, each trying to increase convenience of use and improve quality of sound. Cleaners, cables, storage units, etc. can all be extremely helpful if they do what you want them to. Assess your CD usage and needs before deciding which accessories to buy. Don't think of the five discs you have now when buying a storage unit, but instead consider the 20 discs you'll have a month or two. Choosing the right accessories can make using your CD player more convenient and enjoyable. □



# DISC AND DAT

**CD may have a rival that records:  
Is there a future for Digital Audio Tape?**  
by Craig Stark

**I**n April, 1770, the fourteen-year-old Wolfgang Amadeus Mozart heard a performance of Gregorio Allegri's *Miserere* in the Sistine Chapel. The Vatican held what we would today refer to as the copyright: on pain of excommunication, neither the entire work nor any portion thereof was to be copied without the express permission of the Pope. On returning to his hotel room, however, the young prodigy sat down and wrote out the entire score, note for note, from memory.

News of Mozart's defiant—or delightful—piracy quickly became the talk of Rome (and a source of

concern to his mother back in Salzburg). History does not record whether anyone at the time advanced the argument that the unauthorized copy was "intended for personal, noncommercial use only." We do know, however, that His Holiness took a broad view and knighted rather than prosecuted the future composer of both *Zauberflöte* and the *Requiem*.

Today's music publishers, however, must answer to a lower authority than did the Pope. And they also face a more serious, widespread potential threat. It's called Digital Audio Tape (DAT). DAT uses a cassette roughly half the size of the ubiquitous com-

pact cassette, but more important, it lets you *record* two hours of music with the same top quality sound that is today restricted to the playback-only medium of the Compact Disc.

DAT has been a technological reality for some time. Working prototypes have been demonstrated by several companies both here and in Japan, and standards committees representing some 60 Japanese and 21 "foreign" manufacturers began meeting in 1983 and finished their work in 1985. Even target pricing (\$1,000 to \$2,000, like the first CD players) has been fixed, and at least one large tape manufacturer confi-

# Escort Refuses!

Dear Customer, *From: Drew Kaplan*

Escort turned down our \$10,000 head to head challenge described below. Escort says that Maxon's Radar Detector is "primitive", "bottom-end" and "an off-shore produced electronics 'gadget' ". I don't know about you, but to me these words conjure up visions of a cheap toy being produced off in the middle of a rice paddy somewhere in the middle of nowhere.

Escort, on the other hand, which is made in the U.S., exudes a high cost, quality image. Don't you just bet that it costs a fortune to build Escort and Passport (the smaller version)?

Well, we are going to challenge Escort AGAIN to a head to head 'duel to the death' on Maxon's electronic merits alone. And, we plan to win. But first there are a few things you should know.

Cincinnati Microwave, the company that makes Escort & Passport, is a public company. And being public, they have to file financial information with the SEC.

The public information they have published appears to show that in the year that ended Dec. 1985, Cincinnati Microwave with "substantially all of its revenues and profits derived from the sale of radar warning receivers" made an operating profit of about \$45,810,000 on sales of about \$112,605,000. Wow!

The \$45 million profit is after all engineering, selling and General & Administrative expenses, but before taxes.

Their cost of sales (goods) was only about \$40,027,000. So, if you divide \$40,027,000 by \$112,605,000 it doesn't take a genius to figure out that cost of goods represents an average of only about 35.5% of selling price. Wow!

I only bring up their profit to illustrate that a high retail price doesn't always

mean a high manufacturing cost.

There's no question in my mind that Maxon can manufacture cheaper in an off-shore 'rice paddy', but if you pay \$245 for Escort or \$295 for Passport, it should be based on a head to head test with Maxon, not on perceived retail price points.

## FORGET PRICE COMPLETELY

So, forget that Escort costs \$245, Passport \$295, and Maxon \$99<sup>90</sup>. Let's judge them on their own merits. And, let's look at just what Escort itself has to say about our challenge. (Please read DAK's and Escort's letters to the right.)

Escort says that, "Regardless of the results, such an event lends credibility to the challenger." Well, they are absolutely correct. That's why I put up the \$10,000 in the first place. Fair is fair.

Plus, there are several radar detectors that claim to have won this or that ranking in "Independent Magazine Reviews." So, I'm ignoring any reviews and asking for a one on one, head to head test.

*But look at what Escort says in their letter:* "Range is the easiest detector quality to measure, but by no means the only important quality." Wow, I thought range was really important?? Escort refers to "goodness" being determined by things not so easily measured.

Well frankly, I don't know how to measure "goodness". Escort, in my opinion,

is a top notch company. They make a superb product I'd be proud to sell. And, they have great customer service.

DAK has great toll free technical and regular customer service. But, I'd be the first to admit that with over \$45 million in profits, Escort can probably run circles around us in advertising, and maybe even in service. But, I don't think they can beat Maxon's Radar Detector.

## HOW GOOD IS GOOD?

When Escort was introduced, it was revolutionary. But, you can only go so far. And in my opinion (someone else might object), radar detecting has gone about as far as it can go. So, while Escort has made improvements, it's Maxon who has moved mountains to catch up.

## DAK UPS THE ANTE TO \$20,000

Now I realize that next to \$45 million dollars, \$20,000 isn't much, but it's a lot to DAK. And, I'll even go one step farther. I'll print the exact results of the test, win, lose, draw, or no-show in the first catalog I publish after January 1, 1987.

Escort, the ball is now in your court. Below is the "NEW" version of my challenge with the time and amount changed.

I don't know what else DAK or Maxon can do to prove that the RD-1 Superheterodyne Detector should be judged on its head to head performance against Escort, not on its selling price!

WAS \$10,000

## A \$20,000 Challenge To Escort

Let's cut through the Radar Detector Glut. We challenge Escort to a one on one Distance and Falsing 'duel to the death' on the highway of their choice. If they win, the \$20,000 (was \$10,000) check pictured below is theirs.

By Drew Kaplan

We've put up our \$20,000 (was 10). We challenge Escort to take on Maxon's new Dual Superheterodyne RD-1 \$99<sup>90</sup> radar detector on the road of their choice in a one on one conflict.

Even Escort says that everyone compares themselves to Escort, and they're right. They were the first in 1978 to use superheterodyne circuits and they've got a virtual stranglehold on the magazine test reports.

But, the real question today is: 1) How many feet of sensing difference, if any, is there between this top of the line Maxon Detector and Escort's? And 2) Which unit is more accurate at interpreting real radar versus false signals?

So Escort, you pick the road (continental U.S. please). You pick the equipment to create the false signals. And finally, you pick the radar gun.

Maxon and DAK will come to your highway with engineers and equipment to verify the results. And oh yes, we'll have the \$20,000 check (pictured) to hand over if you beat us by more than 10 feet in either X or K band detection.

## BOB SAYS MAXON IS BETTER

Here's how it started. Maxon is a mammoth electronics prime manufacturer. They actually make all types of sophisticated electronic products for some of the biggest U.S. Electronics Companies. (No, they don't make Escort's).



Bob Thetford, the president of Maxon Systems Inc., and a friend of mine, was explaining their new RD-1 anti-falsing Dual Superheterodyne Radar detector to me. I said "You know Bob, I think Escort really has the market locked up." He said, "Our new design can beat theirs".

So, since I've never been one to be in second place, I said, "Would you bet

\$20,000 (10) that you can beat Escort?" And, as they say, the rest is history.

By the way, Bob is about 6'9" tall, so if we can't beat Escort, we can sure scare the you know what out of them. But, Bob and his engineers are deadly serious about this 'duel'. And you can bet that our \$20,000 (was \$10,000) is serious.

...Next Page Please

Challenge Continued  
 We ask only the following. 1) The public be invited to watch. 2) Maxon's Engineers as well as Escort's check the radar gun and monitor the test and the results. 3) The same car be used in both tests. 4) We'd like an answer from Escort no later than December 31, 1986 and 60 days notice of the time and place of the conflict. And, 5) We'd like them to come with a \$20,000 (was \$10,000) check made out to DAK if we win.

into action in just 1/4 of one second. Just imagine the sophistication of a device that can test a signal 4 times in less than 1/4 of one second. Maxon's technology is mind boggling. But, using it isn't. This long range detector has all the bells and whistles. It has separate audible sounds for X and K radar signals because you've only got about 1/3 the time to react with K band. There's a 10 step LED Bar Graph Meter to accurately show the radar signal's

And you'll have a very high level of protection. Maxon's Dual Conversion Scanning Superheterodyne circuitry combined with its ridge guide wideband horn internal antenna, really ferrets out radar signals.



By the way Escort, we'll be happy to have our test around a bend in the road or over a hill. Maxon's detector really picks up 'ambush type' radar signals.

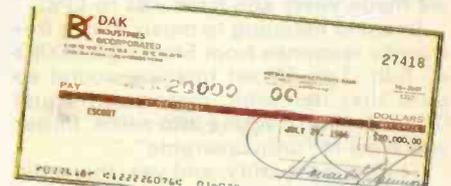
And the key word is 'radar', not trash signals. The 4 test check system that operates in 1/4 second gives you extremely high protection from signals from other detectors, intrusion systems and garage door openers.

So, when the lights and X or K band sounds explode into action, take care, there's very likely police radar nearby. You'll have full volume control, and a City/Highway button reduces the less important X band reception in the city.

Maxon's long range detector comes complete with a visor clip, hook and loop dash board mounting, and the power cord cigarette adaptor.

It's much smaller than Escort at just 3 1/2" Wide, 4 3/4" deep and 1 1/2" high. It's backed by Maxon's standard limited warranty. Note from Drew: 1) Use of radar detectors is illegal in some states.

2) Speeding is dangerous. Use this detector to help keep you safe when you forget, not to get away with speeding.



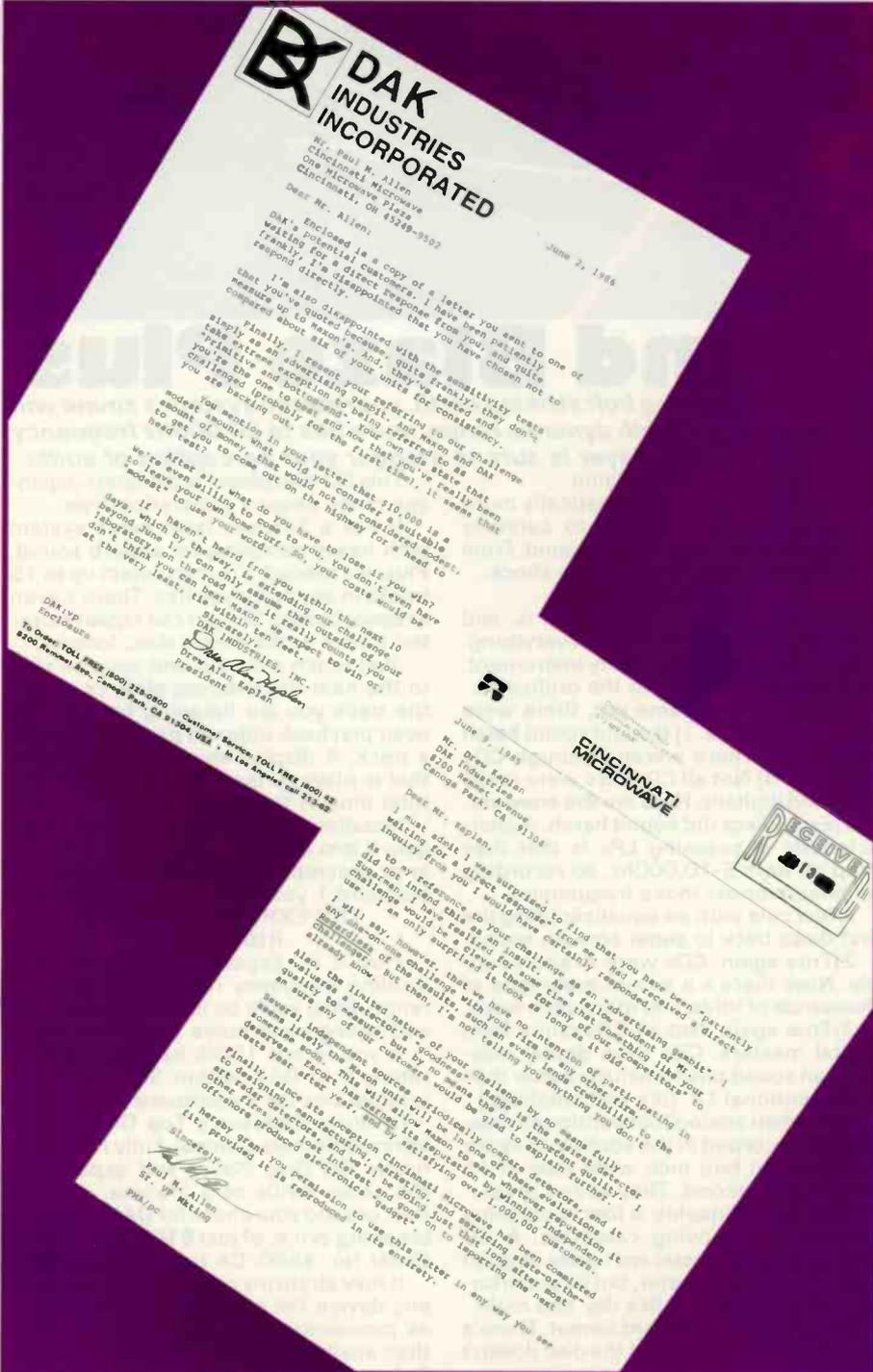
**CHECK OUT RADAR YOURSELF RISK FREE**

Put this detector on your visor. When it sounds, look around for the police. There's a good chance you'll be saving money in fines and higher insurance rates. And, if you slow down, you may even save lives.

If you aren't 100% satisfied, simply return it in its original box within 30 days for a courteous refund.

To get your Maxon, Dual Superheterodyne, Anti-Falsing Radar Detector risk free with your credit card, call toll free or send your check for just \$99<sup>90</sup> (\$4 P&H). Order No. 4407. CA res add tax.

OK Escort, it's up to you. We've got \$20,000 (10) that says you can't beat Maxon on the road. Your answer, please? Escort and Passport are registered trademarks of Cincinnati Microwave.



**SO, WHAT'S DUAL SUPERHETERODYNE?**  
 Ok, so far we've set up the conflict. Now let me tell you about the new dual superheterodyne technology that lets Maxon leap ahead of the pack.  
 It's a technology that tests each suspected radar signal 4 separate times before it notifies you, and yet it explodes

strength. And, you won't have to look at a needle in a meter. You can see the Bar Graph Meter with your peripheral vision and keep your eyes on the road and put your foot on the brake.  
 So, just turn on the Power/Volume knob, clip it to your visor or put it on your dash. Then plug in its cigarette lighter cord and you're protected.

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**\$169<sup>90</sup> MARKET BUSTER**



# Remote Sound Blaze Plus

*Like the blazing flash and violence released by a lighting bolt striking earth, your stereo system's sound will explode with life. With a 95db signal to noise ratio, a 95db dynamic range, and a 5hz to 20,000hz frequency response, Emerson's new programmable remote CD player is sure to stagger your perception of audio.*

By Drew Kaplan

There's no warning. There's no record noise, no tape hiss. Vibrant but finely detailed music just explodes from your stereo system. The sound is like a shock-wave reverberating through your home.

This is the experience you can expect with your first introduction to digital audio. Forget any experience you've ever had before with stereo. CD audio is an awesome advance that dwarfs the switch we made years ago from 78s to LPs.

Imagine listening to music with a frequency response from 5hz to 20,000hz +0.5db -1db. Wow! Imagine sound so pure that harmonic distortion is just 0.003%. And, if you're into zeros, flutter and wow is "unmeasurable".

The sound quality, and yes, the sonic violence will thrill you. I've spent over 15 years on the test bench and in the studios, and the only equal I've heard to this sound is 'live sound'.

And, live sound doesn't mean the sound you hear at a concert where you are simply listening to the auditorium's PA system. Live sound means sitting right in the middle of the orchestra.

I know, I'm a cellist. And, there's just no sound experience like the sound we hear in 'the pit'.

## NO SOUND AT ALL

CD gives you a signal to noise ratio of 95db. There is, for all intents and purposes, absolutely no hiss, no scratch, and best of all, no surface noise.

You've got to experience the silence during very quiet passages to comprehend the sonic adventure of the music. It's as if your stereo isn't even on and then, suddenly, a thunderclap explodes!

Conventional records and tapes have a dynamic range of perhaps 50db. Dynamic range is simply the difference in sound level (volume) between the softest and loudest recorded sounds.

CD gives you a 95db dynamic range, which is roughly equivalent to the difference between absolute silence and

standing next to a jet engine.

Your music will be dramatically more exciting. You won't have to carefully compare CD to conventional sound. From the very first note, you'll be in shock.

## NOT PERFECT?

CD isn't perfect. Or rather, it is, and that's a problem. You'll hear everything. You'll hear every note, every instrument, as if you were sitting in the orchestra.

When CD first came out, there were three complaints. 1) It could sound harsh or hard. 2) There weren't enough CDs released. 3) Not all CD discs were really recorded digitally. **Here are the answers.**

1) Early discs did sound harsh. A characteristic of pressing LPs is that they drop off from 5-10,000hz, so recording engineers boost those frequencies.

A few cuts with an equalizer bring the first discs back to super smooth sound.

2) True again. CDs were in short supply. Now there's a virtual avalanche of thousands of titles, and more each week.

3) True again. Not all CDs come from digital masters. CDs from digital masters can sound phenomenally better than a conventional LP. (It's earthshaking.)

But, when analog (conventional) masters are recorded in the studios, they are recorded on two inch wide tape at 15 inches per second. They sound great.

Most sound quality is lost in pressing records and copying cassettes. A CD from an analog master isn't quite as good as from a digital master, but its superiority over an LP is still like day and night.

CDs are now a standard format. There's no stylus to wear out and the disc doesn't wear out because nothing touches it.

## INFRARED REMOTE CONTROL

You can sit in your favorite easy chair and simply touch buttons. You can hear a track again, or skip to the next.

You can program up to 15 tracks randomly from the remote. And, of course, you can 'Play', 'Pause', 'Stop', and continuously 'Repeat' all from the remote.

## WHY EMERSON?

This CD disc player is the latest Japanese made second generation type.

It has a 3-beam, laser servo system with heavy sampling for superb sound. Plus, it's loaded. You can select up to 15 tracks in any order you like. There's even a repeat button. So, you can repeat selected tracks or the entire disc, forever.

Just touch a button and you can skip to the next track during play, or repeat the track you are listening to. You can even playback indexed passages within a track. A display shows you the track that is playing, the elapsed time, or the total time of the disc.

Installation consists of simply plugging it into any 'aux' input on your receiver or preamp. It's backed by Emerson's standard 1 year limited warranty.

## TRY EXPLOSIVE SOUND RISK FREE

Plug it in. Experience music with a thrilling frequency response and sonic range. Plus, you'll be thrilled by the hiss, and background noise you won't hear.

If you're not 100% satisfied, simply return it to DAK within 30 days in its original box for a courteous refund.

To order Emerson's Top Of The Line Infrared Remote Control, Fully Programmable CD Disc Player and experience the sonic thrills of a lifetime, call toll free, or send your check for DAK's market breaking price, of just \$169<sup>90</sup> (\$7 P&H). Order No. 4640. CA res add sales tax.

It may strain my credibility to describe any device I'm offering for only \$169<sup>90</sup> as providing sound many times better than anything you've ever heard before. But, use DAK's risk free trial to experience this bigger than life sound for yourself.



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# The Truth About VCRs

With over 30% of American Households and over 70% of DAK Customers already owning video cassette recorders, there must be something to them. Are they a hype, a necessity, or a fad? Let's find out.

By Drew Kaplan

First a confession. I like TV. I like movies. And, I don't just watch the nightly news and Wall Street Week.

I have friends who are part of the erudite elite who "don't watch the boob tube" because it isn't cerebral enough.

But, give me a good action film (I love classics), or give me a seamy weekly series with lots of intrigue, and you've got me hooked.

So, what does this all have to do with video cassette recorders? And, why might an inexpensive VCR be your best bet? Well, let's see.

If you're like me, you end up being away from home during your favorite shows. Or, if you've checked the schedule for the new TV season, you may have found that two of your favorite shows are on opposite each other.

And, isn't it frustrating to have two shows on at 9PM and nothing on at 10? Isn't it frustrating being home only two nights of a 3 night mini-series? Well, with a VCR, all these and a lot of other problems can be solved.

## THE HARRIET FACTOR

Harriet is my wife's old team teaching partner. She had never had a video recorder. So, we gave her one. Several weeks later she called, absolutely elated.

She was recording the Phil Donahue show every day and watching it when she got home from school.

She had also recorded several movies from cable that she kept missing while she was at work, or because they were on too late at night for her to watch.

By the way, I have the same problem as Harriet. I have cable and I have a satellite dish. But, I never seem to be able to sit down at the right time.

So, I record movies that come on at 2AM, or while I'm at work.

## THE FAMILY AFFAIR

My parents are another story. They've had a recorder for years (being my parents has its advantages). My parents have two loves, concerts (my mother is a concert pianist), and UCLA Basketball.

They go to concerts several nights a week and tape the UCLA games while they're out. Then, if you can believe this,

they make popcorn and stay up to watch the game till 1:30AM.

And speaking of sports, how many Saturday afternoons do you flip back and forth between several games, only to miss the play you really wanted to see. If you had a recorder running, you could instantly see your own instant replays.

So, for golf, football, baseball, or tennis, you can control all the action.

Plus, forgetting sports for a moment, if you've ever watched magic on TV, wait till you watch the slow motion replay over and over again.

You just might figure out 'sleight of hand' tricks that you never would have understood any other way.

But, back to the family. We gave my wife's parents a VCR and they didn't know how to hook it up.

## THIS IS IMPORTANT

It never occurred to me that there was anything to hooking up a video recorder.

Just unhook the antenna or cable from your TV and connect it to an identical connector on the VCR. Then connect a cable (included) between the recorder and your TV. That is the complete cable hookup. What could be easier?

Anyway, my father-in-law gets up at 5AM, so they go to bed very early. Once they hooked up their recorder, they discovered a whole world of late night TV.

Now they watch Dynasty during dinner. And look. They had never stayed up to see the Johnny Carson show.

Wow! A video recorder can let you watch what you want, when you want, without being restricted by your work, social life or sleep. Now you can watch last night's midnight show at dinner, or tonight's dinner show at midnight.

## LOADS YOU CAN DO

If you're going on vacation, you can keep up with weekly series while you're gone, even on different channels.

You can record shows you want your children to see at a more appropriate time. For example, it really galls us that the Christmas specials all seem to come on after our youngest son's bedtime.

And besides, he likes to watch them several times. And, speaking of being galled, he's galled because his older

brother can stay up and watch shows after he has to go to bed.

So, it's not unusual for us at the Kaplan household to be taping channel 7 while we're watching channel 4. I wonder how the Nielsen ratings cope with taping?

And while we're on ratings, the advertisers on TV hate VCRs. They hate VCRs because we all tend to use our wireless infrared remote controls to fast forward through their commercials.

And, if the phone rings (which it always does), I can simply pause the tape without missing the final clue to a mystery.

And there's still more. If I'm home but my wife and/or kids are out, who wants to watch a comedy or a love story alone?

It's much better to tape it and watch it when the whole family can be together.

Plus, with all the movie rental shops around, you can rent an evening of entertainment for as little as a \$1.

And, lots of people seem to be doing just that. The latest statistics show that people are staying home and watching rented movies rather than going out to restaurants and movies.

I'm sure glad I own an electronics company and not a restaurant. And while you may decide for yourself whether VCRs are a fad or a necessity (I vote for necessity), since they do all of the above, they certainly aren't a hype.

Two is better than one. We have several VCRs (I do have a great job). Even though only 70% of DAK customers own VCRs, they/you actually own a total of more VCRs than we have customers.

So, the Kaplans aren't the only family that enjoys having a recorder in both the family room, den and/or bedroom.

With two recorders, you can tape two different shows, and you can make copies of tapes. (Note: Making copies of many movies, even off the air, is illegal).

Now it's time to examine the features on the latest Japanese made Cable Compatible VCRs with HQ Picture Enhancement and Wireless Infrared Remote Control. Let me tell you about 3 VCRs.

The least expensive will probably do everything you want. So, don't spend a dime more than you have to.

...Next Page Please





### ... Video Continued

These VCRs are all top quality and you can expect years of entertainment.

#### QUESTIONS

I get lots of questions about the difference between Cable Compatible and Cable Ready. There is none. Last year, the Electronics Industry Association decided to use Cable Compatible because to them, Cable Ready might imply unscrambling signals.

The latest NEW in VCRs is HQ, and few people know what it is. In short, it's a circuit that improves the definition of the recorded picture. You'll note a distinct separation between whites and colors.

It really does enhance the sharpness and quality of the detail in your recording, especially at slow speed.

#### Window Number One

(SEE PICTURE ON PREVIOUS PAGE)

Here's a front loading, infrared remote control VHS video cassette deck from Emerson with HQ that will give you great recordings and phenomenal control.

From the moment you put a video cassette into the front loading motorized slot and see it automatically drawn into the recorder, you'll appreciate the quality.

**107 Channel Electronic Tuning.** This recorder's synthesized tuner can tune in VHF channels 2-13 and UHF 14-83. Plus, you'll also be able to tune in 25 Mid-Band and High-Band Cable Channels.

You can choose any 16 channels for instant step tuning from either the recorder or the remote. You can choose from any band in any order you like.

#### MASSIVE PROGRAMMABILITY

You can select up to 8 programs over a two week period to record. And, you can select one program to record every day. If you can set an alarm clock, you can program this recorder to record.

8 programs is the most I've seen on any recorder, but it can really come in handy. I missed the final episode of Knots Landing last year because I thought I would be home earlier. If anyone could send a copy, I would really appreciate it.

And there's One Touch Timed Record. It lets you automatically record in increments of 30 minutes.

#### WIRELESS INFRARED REMOTE

From system power to forward and reverse high speed search, to changing channels, you're in full control. If a remote seems to simply smack of posh luxury, look at what it can do for you.

You can touch the still frame button and freeze the action. Now you can really tell if the umpire was correct or not.

You can play the same movement over and over again until you are absolutely sure of what you've seen.

And, don't forget, you can high speed search through commercials.

And if you're like me, you'll use the tuner in this VCR while you watch live TV so that you can remotely flip stations during commercials. This VCR makes any TV Cable Compatible.

#### AND MUCH MORE

There's a digital clock/timer and even a tape counter. Of course, you can watch one program while you record another. And, there's a picture sharpness control.

There are 3 recording and playback speeds for up to 8 full hours of recording. And finally, when a tape reaches the end, it will automatically rewind.

So while Emerson's Window One VCR at \$249<sup>90</sup> is the least expensive, you can easily see that it's loaded with features to help you enjoy your video experience.

#### Window Number Two

(SEE PICTURE UPPER LEFT)

Here's a front loading, infrared remote control VHS video cassette deck from Emerson with HQ that will give you special effects and more.

**First the special effects.** This is a 4 head VCR, which means that instead of two video heads there are 4.

This allows you to have superior still frame and lets you have slow motion. Now you can really slow down the action and study a golfer's swing, a magician's hands or a rocket ship landing.

If you want to scrutinize your movies, this is the recorder for you. The extra two heads can also have an improved effect on slow speed recording, but frankly, today's pictures are so good there's not much to improve.

**105 Channel Electronic Tuning.** This

recorder's direct access tuner can access VHF 2-13, UHF 14-83, plus 23 Mid-Band and High Band VHF Cable Channels.

There are 12 buttons that you can set to any channels you choose for instant direct access.

#### WIRELESS INFRARED REMOTE

From system power to forward and reverse high speed search, to still frame and Slow Motion, you're in full control.

Plus, you can directly access from the remote any of the 12 preset channels.

So, just imagine watching a movie and wanting to slow down the action from your favorite easy chair. You can really get a good close look at whatever captures your interest. And of course, flipping channels is a breeze. This recorder makes any TV Cable Compatible.

#### FULL PROGRAMMING

You can select up to 4 programs over a two week period to record. And, you can select one program to record every day. It's about as easy to program as your alarm clock. Plus, it features One Touch Timed Record.

#### MORE GOODIES

There's a digital clock/timer and a tape counter. Of course, you can watch one program while you record another. And, there's a picture sharpness control.

There are 2 recording and 3 playback speeds for up to 8 full hours of recording. And finally, when a tape reaches the end, it will automatically rewind.

So from golf to magicians, from my son's soccer to space movies, you can really bring a movie's special effects down to earth, with the control you have of this \$299<sup>90</sup> 4 head Window Two VCR.

It will give you greater control of your picture and random access tuning of your channels at both the recorder and from the remote.

#### Window Number Three

(SEE PICTURE UPPER RIGHT)

Here's a front loading, infrared remote control, 4 head VHS HiFi VCR with HQ that will knock your socks off.

VHS Stereo HiFi gives you an incredible 20hz to 20,000hz frequency response with an 80db dynamic range.

...Next Page Please



### ... Video Continued

You'll experience the full sonic drama of movies that you rent, and add a superb audio tape deck to your stereo system.

And, not only can you record or turn any TV into a Cable Compatible TV, you can receive the new stereo TV broadcasts automatically. So, why replace a perfectly good TV just to get stereo?

VHS HiFi uses the spinning video heads to record sound along with the video on the tape at speeds in excess of 200 inches per second. So, the sound quality is, to say the least, astounding.

Of course, there's a conventional stationary audio head, so this recorder is compatible with all standard tapes, but wait till you hear the sound. **And, wait till you use this recorder for recording music in your stereo system.**

Using video cassettes, you can record audio only for the best recordings you've ever heard through your stereo system.

**And look at this.** With VHS tapes selling for about \$5, you can record up to 6 hours of this incredible sound on one cassette with or without a picture.

### THE BAD PART

Connecting this video recorder to your TV is done just like the previous two recorders. It's simple. But, to utilize the VHS HiFi and Stereo TV tuning, you must also connect this VCR to your stereo.

Just connect the standard stereo patch cords (included) to any 'Aux' input.

So, the bad part is that if your TV and stereo aren't together, this incredible machine isn't for you. Of course, it always sends conventional TV sound to your TV.

**139 Channel Electronic Stereo Tuning.** You can select any 16 preset synthesized cable compatible channels by touching a direct access button on the remote. And, every one is ready for stereo. It receives VHF 2-13, UHF 14-83, and cable 14-65 and Cable Sub Band 95-97.

### WIRELESS INFRARED REMOTE

From system power to forward and reverse high speed search, to still frame and Slow Motion, you're in full control.

Plus, you can directly access the 16 preset channels from the remote.

So, you can slow down the action, you

can still frame it or you can speed it up. **PROGRAMMABILITY TOO**

You can select up to 4 programs over a two week period to record. And, you can select one program to record every day. If you can set your alarm clock, you can program this VCR. It also has One Touch Timed Record. Each time you touch the button, you will add 30 minutes of recording, up to 2 hours.

### LOADED

There's a digital clock/timer and a tape counter. Of course, you can watch one program while you record another. And, there's a picture sharpness control.

There are 2 recording and 3 playback speeds for up to 8 hours of recording. And, when a tape reaches the end, it will automatically rewind.

Plus, you can receive Simulcast, SAP (Separate Audio Program) and there's a headphone jack. Tape loading is motorized. And, there's a VHS HiFi level meter.

So, if you use this VCR for video or as an audio deck, you're in for a treat. And, if you add surround sound, wow!

**Note:** Most movies you rent not only have great sounding stereo, but surround sound information already on the tape.

So for special effects, for 139 stereo cable channels, for the incomparable VHS HiFi Sound, choose the \$499<sup>90</sup> Window Number Three VCR.

### HARD CHOICES

All three decks provide superb picture quality, wireless infrared remote control and programmability. To record weekly series or play back rented tapes, Window One will provide all you need.

If you record ball games and you want to have the capability of slowing down any movie's action, plus add random access to your remote, choose Window Two.

Where only the top of the line will do and you're going to get involved with the sound as well as the slow or fast action, move all the way up to Window Three.

Whatever your choice, you'll be thrilled with the quality and performance of these Japanese crafted VCRs. They are backed by Emerson's limited warranty.

VIDEO COMES ALIVE

### RISK FREE

It's not an easy choice. I've used them all. In my main system I do have the VHS HiFi deck. I love the sound and, of course, the picture. But, I have the Window One, least expensive VCR in our bedroom, and it works great.

Whichever VCR you choose, if you're not 100% satisfied, simply return it to DAK in its original box within 30 days for a courteous refund.

To order Emerson's Window Number One VCR with HQ and Wireless Infrared Remote, 107 Channel Tuning and 8 program capability risk free with your credit card, call toll free, or send your check for DAK's breakthrough price of just \$249<sup>90</sup> (\$11 P&H). Order No. 4641.

To order Emerson's Window Number Two VCR with HQ, Special Effects and wireless Infrared Remote with 12 channel Random Access Tuning, 105 Channel Tuning and 4 program capability risk free with your credit card, call toll free, or send a check for DAK's breakthrough price of just \$299<sup>90</sup> (\$11 P&H). Order No. 4642.

To order Emerson's Window Number Three VCR with HQ, VHS HiFi, Special Effects and Wireless Infrared Remote with 16 Channel Random Access, 139 Channel STEREO Tuning and 4 program capability risk free with your credit card, call toll free, or send your check for DAK's breakthrough price of just \$499<sup>90</sup> (\$11 P&H). Order No. 4643. CA add tax.

Well, if you haven't joined the 30% plus of the households that own VCRs, at least by the time you've read this far you've probably got a pretty good reason.

I find that VCRs are one of those things that I just can't see how I ever lived without. And with Emerson's quality and price, this is a perfect time to add a second VCR if you already own one.



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## The \$999 Typewriter/Computer **BOMBSHELL**



# Unfair Competition?

## An Unfair Challenge to IBM's Typewriters and Computers

*What if you and every secretary in your office could have powerful computers that were as easy to use, but cost less than IBM electronic typewriters? What if they also ran IBM compatible software? Well, now you can get this 256K IBM PC Clone, the Amber Monitor, the Letter Quality Printer, and The \$400 Software Library for just \$999.*

By Drew Kaplan

Look around your office. Are your secretaries wasting time typing and re-typing letters and documents?

Well, throw out your dumb typewriters. Now typing on an IBM compatible computer can be as easy, and yes, cheaper than using an IBM electronic typewriter.

Every word you type can be stored in the 256,000 character memory or on floppy disks. So, when you make corrections to a letter or document, you'll never need to retype the whole letter again.

### 30 MINUTES TO PRODUCTIVITY

In 30 minutes you or your secretary will be comfortably typing letters faster than on any typewriter. This computer is so easy to use that there's no 'computer fear' from non-computer typists.

But, if you're looking for computing power, get ready to blast off. It is so powerful that it will run Lotus 1-2-3, Flight Simulator and every other IBM compatible program that we've tested.

In fact, the manufacturer states in the Operator's Guide that, "The computer is ultimately and completely compatible with the IBM Personal Computer."

Actually, typing letters is child's play for this sophisticated machine. But for \$999, it's sure to be the most popular typewriter in any office or even at home.

So, compare it to the typing ease and durability of say the new IBM Wheelwriter 5 at about \$1045, or a Xerox Memory-writer 625 at about \$1595.

Or compare just the computer section to the agility, speed, and intelligence of an IBM computer. Then, check our price.

### FORGET LIFT OFF CORRECTION

Think about making a change in the first paragraph of a letter you have dictated. Just mark up the draft copy and give it back to your secretary.

She can bring the letter back onto the 80 column 25 line Amber Monitor, make the corrections, touch one button and

the letter will automatically print out with your corrections and additions.

You'll never have to reread or re-proof retyped letters again for errors. And instead of spending 15 minutes retyping and re-proofing, your secretary can be working on your next project.

A typewriter-type word processing program whose commands flash on the screen, when needed, makes this the ideal transition from typewriter to computer.

Look how easy it is to use. Simply touch the F1 key at the left of the keyboard to delete a character. F2 deletes a word. And, F3 deletes a whole line.

F5 turns this machine into a line by line typewriter for typing directly onto envelopes or forms. F6 prints out anything on screen at any time.

This is a magnificently simple program that you or your secretary will be comfortable with in 30 minutes.

But when you are comfortable, you'll want to open our sophisticated \$400 Software Library that lets you really start to use the power of this computer.



(DAK's added Software shown with included Visual Manuals)

You can type in lists of your customer's or employee's names and addresses. Then create a letter, select which names you want to receive the letter, and the computer will automatically print out individualized letters for each person.

So if you want 5 people or 500 people

to be notified personally of your newest product or policy, now it's all automatic.

There's also a Budget Program, a Calendar Program and even a Portfolio Management Program we have included.

Of course you can use any IBM compatible PC programs from Lotus 1-2-3 to Norton Utilities. Or, you can buy other even more sophisticated word processing programs that even correct your spelling or give you an on-line thesaurus.

### MORE THAN A TYPEWRITER

This IBM compatible computer with its two 360 kilobyte drives, 256K random access memory (more is available), composite video and yes, even RGB full color graphics output, is made by Visual, the 5th largest manufacturer of office graphics terminals.

Visual's computer is loaded. It has both a Centronics parallel printer output (we've included a superb daisy wheel letter quality printer) and an RS232 serial communications port (yes, you can add a modem to access outside data banks, or your main frame computer).

Visual's 1985 price list shows a list price of \$1895 for this computer. And, that doesn't include the Amber Monitor, the Printer, or the Software Library that we've added. It just includes the computer and of course the IBM compatible MS DOS 2.1 operating system.

### WHY SO CHEAP?

Visual makes terminals. They thought they'd design a superb IBM Clone and sell it with their terminals.

Well it turned out that Visual's salesmen weren't equipped to sell computers and Visual had put too much money into these computers (the built-in color graphics, TTL output, 2 floppy disk drives and lots of other features) to sell them at today's stripped down prices.

So, Visual has sold them all to DAK and has taken an enormous loss. (But don't worry about Visual. They are a

large company and 'dumping' these computers just lets them get back to concentrating on their main terminal business.)

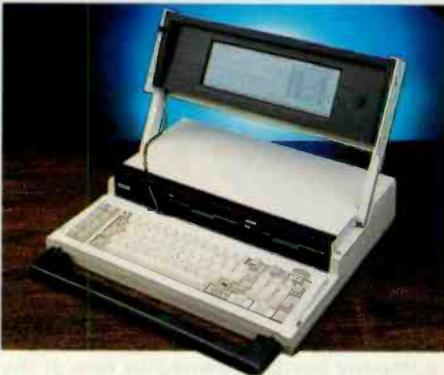
So, you'll save a fortune and that's why this is an unfair comparison to IBM.

You see, you're saving money only because Visual lost money. IBM not only needs not to lose money, but needs to make a profit as well.

And, don't worry about ending up with an orphan. Unlike small computer companies that come and go, as long as Visual makes terminals, they will be around to protect your investment. Plus, they use the Sorbus Network for service. **TAKE YOUR WORK HOME TOO! Wow!**

With the addition of a \$149 optional 25 line 80 column LCD display, you can take this computer home. It only weighs 18 pounds, so it's easily transportable.

So, when it gets to be 6:00 and there's still work to be done or files to be studied, just take the computer home or send it home with your secretary.



And, with the addition of a modem, you can even transmit files from home to the office. Or, you can log onto data bases like CompuServe or Dow Jones.

#### THE GOOD, THE BAD, & THE BEAUTIFUL

From your first touch of the rugged sculptured keys of this computer, you'll appreciate the built-in rugged quality.

There's even a 10 key numeric pad. The 83 key keyboard is identical to IBM's PC, except for the addition of lights on the 'Cap Lock' and 'Number Lock' keys.

The contoured keyboard is extremely comfortable. But, I must warn you that if you've never typed on an IBM PC, they've made the Shift keys and Return Keys slightly smaller than on a typewriter and it will take you a few minutes to adjust.

The computer has two floppy disk drives that use double sided double density 5 1/4" floppy disks. Each floppy disk holds 360,000 characters.

As a free gift from DAK, we're including a box of 10 disks. You can store 3,600,000 characters.

The computer uses a 16 bit 8088 Intel processor with a 4.77 MHz clock speed. It is AC powered and UL and FCC listed.

There is 256K of installed random access memory (RAM) for you to use as compared to 128K for most computers and the 7K on the IBM Wheelwriter 5.

We've included Magnavox's latest 80 column 25 line 12" non-glare Amber Monitor. It has 900 lines of horizontal resolution and 350 lines of interlaced vertical resolution to display graphics.

You can also connect an RGB (red green, blue) monitor for full color graphics. With most computers, the internal 'color card' can cost you several hundred dollars. Visual's has it built-in.

You can expand this computer by adding custom cards. There is an expansion port that can be directly connected to an IBM expansion chassis. Of course, the computer is infinitely expandable by running IBM compatible software.

Here's another bad point. This system is bigger than a typewriter. The computer is 18" wide and 15 1/2" deep. And, with the monitor sitting on top, it is 14 1/2" tall. Actually, the computer really isn't any bigger than a typewriter.

But don't forget the printer. It can be placed up to 6' away, but it really belongs next to the computer so that you can easily put in paper, envelopes etc. It is 15 1/2" wide and 12 1/2" deep.

So for most productive use you need a return on your desk that is about 33 1/2" long. Of course, the printer can sit on a typing stand next to your desk or even your credenza. You'll be amazed at the increase in your productivity.

**THIS IS NOT A CHEAP STARTER COMPUTER.** Forget our price. Put it side by side with a similarly equipped IBM, run the same programs and you'll get the same results.

In fact, it's so compatible that you can interchange disks of your letters and programs between Visual's computer and an IBM PC whenever you wish. Wow!

#### THE PRINTER

This Silver Reed daisy wheel printer will type on your standard letterhead, envelopes, 3 X 5 cards or mailing labels.

It uses the same type interchangeable daisy wheel direct impact print system as typewriters (heavy duty of course).



The printer prints at 10-12 characters per second bidirectionally. You can set horizontal spacing, 'pitch', for expanded or contracted letter spacing. You can underline automatically and you can print normal or Bold.

But, don't worry. You can simply put in your paper and type. You can even use continuous form tractor feed paper with the optional \$69 tractor feed.



Or, use your own letterhead with the optional \$119 cut sheet feeder.



#### FINAL NOTES

Both the Silver Reed Printer and Magnavox monitor are backed by their respective manufacturers' limited warranties. The Visual Computer is backed by Visual's limited warranty and serviced by Sorbus (or Visual).

#### DON'T FORGET IT'S PORTABLE

For just \$149, you'll get the factory installed 80 column 25 line (graphics capable) LCD display which simply lifts off when you're using the Amber Monitor.



You may not take your computer home or to another office every day, but the versatility is phenomenal.

#### ACCEPT OUR TYPEWRITER COMPUTER CHALLENGE RISK FREE

Wait till you see this state of the art computer marvel on your desk. And wait till you see what its incredible computing power can do for your productivity.

If you're not 100% satisfied with its typing or computing ability, simply return it to DAK in its original boxes within 30 days for a courteous refund.

To get your Visual 256K IBM Compatible Computer with Two 360K Floppy Disk Drives, Composite and RGB Outputs, Amber Monitor, Silver Reed Letter Quality Daisy Wheel Printer, \$400 value Software Library, 10 Free Double Sided Double Density 5 1/4" Disks and connecting cables for the monitor and the printer risk free with your credit card, call toll free or send your check for DAK's limited Close-Out price of just \$999 plus \$24 for P&H. Order No. 4500. CA res add tax.

#### OPTIONS

If you're into massive spreadsheets and the largest programs, order the 512K upgrade which doubles the 256K memory. It's installed by the factory for an additional \$129 (\$5 P&H) Order No. 4625.

Add the Factory installed 80 column LCD 25 line display so you can move Visual's computer and work wherever you want. It's just \$149 (\$5 P&H) Order No. 4626.

If you want to run continuous forms, from mailing labels to checks to letterhead, the Silver Reed Tractor feed snaps on and off in about 30 seconds. It's just \$69 (\$3 P&H) Order No. 4345.

Use your standard letterhead automatically with the cut sheet feeder. It feeds paper like an automatic copier tray. It's just \$119 (\$5 P&H) Order No. 4627.

Standard 300,000 character black poly ribbons are just \$6 (\$0.50 P&H) Order No. 4346. You'll never see a lifted off correction mark that shows where errors have been removed again. You'll get 'Presidential Quality' letters that you'll be proud to mail every time.

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# a rose by any other name

*It's the sweetest phone that this writer has ever used. From its elegant good looks to its elegant sounding speakerphone, it's a class act. And, it remembers and dials up to 200 numbers by THE NAME of the person you want to call. Plus, it's now available in ivory and 1-line models too.*

By Drew Kaplan

It's not red. And it has no aroma. But it is definitely a rose amongst the thorns. Here's an all new name dialing 2-line conferencing speakerphone that will revolutionize your concept of telephones.

As president of DAK, I've tested hundreds of phones. Some are very good and you will find them in DAK's catalog. But, I've never used a better sounding, more useful phone, at home or at the office, than the phone pictured above. Let me tell you some of the reasons why.



## FIRST, IT DIALS BY NAME

I hate having to remember phone numbers. With this phone, all I do is push the 'H' button when I want to dial Home. The 'D' button dials DAK. And, the 'I' button dials my insurance broker.

Most other dialers make you remember location numbers, such as '26' for 'Mom'. So, you're really just substituting one number for another. Now, all I need to remember is the person's name.

Where I have more than one name that begins with the same letter, I can scroll through the names before it dials, or enter just the first 3 letters. So, if I want to dial Howard instead of home, I push 'H', 'O', 'W'.



It's quick, it's easy and you'll never have to remember or look up and dial anyone's number again. Each memory location can hold up to 32 digits and you can store up to 200 different names. It has a memory capacity of 4096 digits.

You can store your Sprint and MCI codes with the person's name, in a separate location that the phone automatically accesses as it dials, or totally separately so that you can automatically access the service and then dial a number manually.



And speaking of manual dialing, you don't even have to push the speakerphone button to dial. When you touch the first number on the dial, the phone automatically seizes the line, turns on its speaker, and you have on-hook dialing.

So, you never have to lift the receiver or activate the speakerphone unless someone answers the line.

## FORGOTTEN HANDSET

This phone has the latest K2 handset. It gives you traditional Phone Company fit and feel, yet, I find it even more comfortable to use.

But, you'll probably never use it. The speakerphone is so powerful, so clean, and so easy to use, you'll never pick up the handset unless you need privacy.



I've used good speakerphones before, but this speakerphone's sound quality rivals an in-person conversation, not a phone call. How's that for a description of a phone you can try on a 30 day risk free trial?

## 2-LINE MASTERPIECE

You can select Line 1 or Line 2. And, you can push 'Conference' to combine both lines for convenient business conferences or friendly group calls with friends. There are LEDs that show which line is 'In Use', 'On Hold', or 'Ringing'. And, there are different rings for each line.

Installation is a breeze. It simply plugs into one standard modular 2-line jack or two modular 1-line jacks. Nothing could be simpler. Just plug it in.

## PAGES OF HELPFUL FEATURES

The list of features would have to be microfilmed to fit on this page. There's a large LCD display that shows you the name you want to call and the number.

An automatic timer tells you exactly how long you've been talking. And, a clock appears on the display whenever you hang up.

Every conceivable feature from Mute to Tone/Pulse switching, to Pause, to Flash, to battery backup (2 C batteries included), to three direct Emergency Memory Keys and more is included.

There's even Automatic Redial which will redial a busy number for you every 30 seconds.

## YUPPIE POWER

I'm anything but a yuppie, even though I just turned 40, but when you look at the sleek, swept back, silver-grey HiTec appearance, and when you examine its complete computer keyboard, you'll understand why it would warm a yuppie's heart. My heart is warmed by what it does, but I must admit it is impressive.

It's made by Colonial Data, a research company partially owned by one of the largest inter-connect (big business phone systems) companies in the world.

It is 9½" wide, and it's backed by Colonial's standard limited warranty. **PUT NAME DIALING ON YOUR LINE RISK FREE**

It's the best sounding speakerphone I've ever heard. Dialing by names instead of numbers is a quantum leap in both technology and convenience.

Now, I don't have to remember people's phone numbers. I just touch a 'C' for customer and let the phone do the rest.

If you are not 100% convinced, as I am, that this is the best sounding, most convenient phone you have ever used, simply return it in its original box within 30 days for a courteous refund.

To order your Name Dialing 2-Line Speakerphone with God only knows how many features risk free with your credit card, call toll free or send your check for DAK's breakthrough price of just \$129 (\$4 P&H). Use Order No. 4335 for Silver-Grey. Or, use Order No. 4452 for Ivory.

If you'd like the 1-line model in Ivory without the 2-line features, it's just \$99<sup>90</sup> (\$4 P&H). Order No. 4453. CA res add tax.

In DAK's electronic world, where a new best is achieved almost every day, this phone stands out as the 'best' best I've ever had the pleasure of introducing. DAK and the 'a rose by any other name' phone are not affiliated with CXC Corporation's Rose Console.



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# What's a Mamfactacdc?

Have you guessed yet? It's all the musical sources in this incredible, top of the line, complete music system, backwards. And, if you think Mamfactacdc is a mouthful, wait till you see all you get for just \$299. Wow!

By Drew Kaplan

It's party time. With a Mamfactacdc, there's something for everyone. And, wait till you hear the sound.

This top of the line complete stereo system has more musical sources than any modular system I've seen. And, the sound from each source is breathtaking.

Let's explore all that it does on a musical source by source basis.

**CD = Compact Disc Player.** And it's not just any player. You can program up to 20 different selections in any order you desire. Wow, 20 memories!

You'll have Next Song and Previous Song. There's even Repeat so that you can have continuous music from 1 disc.

This CD even has a motorized front loading system. Its oversized display shows track number or running time, and, of course, program selections.



But, you've really got to hear a CD for yourself. The sound quality and clarity of the music is so awesome it makes the switch from 78s to LPs a non-event.

**CA = Cassette Deck Times 2.** There are twin high speed dubbing cassette decks. You can duplicate tapes at high speed or normal speed.

The decks are matched for flawless copies and there's even mike mixing. You'll love this feature if you sing.

Simply put a recorded tape in deck 'A' and copy it onto deck 'B' as usual. But, while you're copying, you can add your own vocal. Just plug in your mike and sing. You can be a single, a duet, a trio, or even a chorus by repeated recording.

Of course, you can make original tapes from any of this system's musical sources.

And, look at this. There's even sequential play, so you can play a cassette in one deck and when it's finished, the other deck will automatically start. You'll have twice the amount of uninterrupted music.

With these twin decks, you'll make great recordings and enjoy great sounding music from your cassettes.

**TT = Belt Drive Turntable.** It's a semi-automatic turntable with a hinged dust cover. A low mass tone arm and quality cartridge protect your cherished records while providing superb reproduction.

You can listen to LPs and 45s. There's automatic arm return. And, there's a cueing control for record protection and easy track selection.

In a world gone CD crazy, if you're like me, you'll still want to listen to your record collection. And, this stable turntable should provide years of superb listening pleasure from your records.

**FM/AM = FM stereo and great sounding AM** are yours with the sensitive tuners in this system. A large slide rule dial makes it easy to find stations.

There's a built-in antenna or you can connect to an outside antenna. Just wait



till you hear your favorite stations locked in by these receivers.

## MUCH MUCH MORE

There's a 5 band equalizer so that you can sculpture your sound just the way you want it. You can really 'detonate' the bass or high end for room filling sound.

And speaking of vibrant room filling sound, the matching 2-way speaker systems really pack a punch. Rich deep bass is produced by the woofers, and crystal clean highs by the tweeters.



Emerson had to use better than normal speakers in this system to handle the dramatic capabilities of the CD. You won't be disappointed with the full rich sound.

There's no volume knob because this system has an electronic volume bar. Just touch one end or the other.

And there's one more thing. There's a built-in clock timer. You can have this system shut itself off automatically. Or, you can have it turn itself on.

When it turns itself on, it can wake you with your favorite music, or if you've set it to record, it can record from the AM or FM radios. Wow, how neat.

It is 16 1/2" tall, 14" wide, and 13 3/4" deep. Each speaker is 14 1/4" tall, 7" wide, and 9 3/4" deep. It's backed by Emerson's standard limited warranty.

## MAMFACTACDC IN YOUR HOME RISK FREE

You'll be amazed at the sound. And you'll be thrilled by your choice of musical sources. It's an incredible system. If you're not 100% satisfied, simply return it to DAK in its original box within 30 days for a courteous refund.

To order Emerson's Stereo System with 20 Program Capability CD Player, Dual High Speed Cassette Decks, Belt Drive Turntable, AM and FM Stereo, Speakers, Equalizer and Timer Stereo system risk free with your credit card, call toll free or send your check for DAK's breakthrough price of just \$299 (\$18 P&H). Order No. 4684. CA res add tax.

A lot of sources stuck together wouldn't mean much if they weren't top quality. Just wait till you hear how your favorite music sounds through this system.



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# DO ALL CD PLAYERS SOUND THE SAME?

*Listening tests conducted by David L. Clark  
provide surprising answers*

*by Ian G. Masters*



**Stereo Review**

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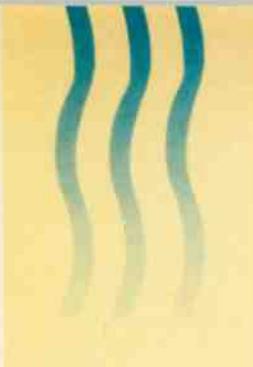
One of the things that makes a digital future so attractive, according to its advocates, is that the digital disc is an absolute. Not only is it hiss-free, scratch-free, and pop-free, not only does it have wide dynamic range, low distortion, and all those good things, but it is also quintessentially consistent. In theory, if the CD format standards are met, the characteristics of the playback equipment are unimportant, because a given data stream on the disc will produce the same flawless audio signal from any player.

But is that really so? A great many very experienced listeners think it is, but probably as many deny it. Without even considering relative quality, the lines have been drawn between the faction that says "CD players all sound alike" and the one that claims "CD players sound different." The former listeners are perhaps influenced by the hope that audio has finally come up with something that is unquestionably unquestionable, the latter by the belief that nothing could be as good as CD's are supposed to be.

*If you can hear the difference between two speakers, a claim can be made that one is better. Or you may prefer one because of how it sounds. Do CD players, like speakers, sound different enough to give you a basis for choice?*



ROBERTO BROSAN



Without becoming embroiled in the "philosophical" aspects of the question, STEREO REVIEW decided to find out what, if any, audible differences there are among CD players. The editors started with the basic belief that if there are sonic variances they are very small, but that any real distinctions that do exist must be subject to proof by means of scientifically designed and controlled listening tests.

To this end, the magazine enlisted the aid of David L. Clark, of DLC Design, who developed the double-blind ABX comparator, and of the redoubtable Southeastern Michigan Woofer and Tweeter Marching Society (SMWTMS, pronounced "Smootums" by its members), a Detroit-based club that has few rivals as a bastion of concerned, but sane, audio enthusiasm. The club's members are extremely experienced listeners who have taken part in many critical audio experiments over the years. During the two heavy days of tests, eleven members of the society took part—a number large enough to filter out any "club prejudices" and to give statistical validity to the test results.

*With the ABX system, two components are compared. Listeners switch between the A or B sources and source X, which is either A or B, as randomly selected by the comparator, and decide which source is identical to X.*

The question of audible differences may be a burning issue for some serious audiophiles and engineers on a purely theoretical level. But for the majority of those interested in audio equipment and recorded music it is an important practical matter. Most equipment is sold on the basis of the way it differs from the rest of what is available. If you can hear the difference between

Speaker A and Speaker B, a claim can be made that one is *better* than the other. Or you may *prefer* one over the other because of the way it sounds. Do CD players, like speakers, sound different enough to give you a basis for choice? That's the question STEREO REVIEW hoped David Clark's tests with SMWTMS would answer.

The tests took place in mid-September in a listening room at DLC in Michigan, constructed according to a proposed IEC standard, using a pair of Magnepan MG-III A speakers driven by a Threshold S/500 Series II 250-watt-per-channel amplifier. An ABX comparator was used for A/B switching.

With the ABX system, two components, a reference source and a "device under test," are compared. The listeners switch between the A or B sources and a source called X, which is either A or B, as selected randomly for each trial by a microprocessor in the comparator. Listeners can spend as much time as they want in a trial, switching between A, B, and X, before they go on to the next trial in the test. In each trial listeners must decide whether X is the same as A or B. If the differences between the two sources are readily audible, this is a simple matter; if the sources are similar in sound, the task becomes more difficult. Identical-sounding sources elicit a random series of choices, since some choice must be made, but even very subtle differences should show a statistically significant increase in correct choices, even if the listeners think they hear no differences. The ABX system is designed to reveal differences only, not preferences between sounds.

Because listeners are asked to decide whether X is *identical* to A or to B, the only difference between the two sources must be their audio characteristics—anything else could "tip off" the listeners. For instance, if one source was even slightly ahead in time of the other, it would become immediately apparent when switching between X and either source. For this reason, the outputs of the players under test were matched as closely as possible before the listeners were allowed to hear them.

Levels were extremely important, for it is well known that even the slightest level difference will tend to make the louder unit seem "better." In fact, during the early part of the test sessions, one player was misadjusted, so that its signal was a mere

0.2 dB higher than the reference, and virtually all the listeners caught it. While the misadjustment made this particular test series invalid, it did serve to prove the effectiveness of the testing system and to affirm the listeners' qualifications. (The unit was retested later with the correct levels.)

The most difficult part of the pro-

*Identical-sounding sources elicit a random series of choices, but even very subtle differences should show a statistically significant increase in correct choices, although the listeners may think they hear no differences.*

cedure was keeping the two machines, the reference player and the one under test, in perfect synchronization. Synchronization was important, however, because any musical difference between the two sources would have immediately indicated whether X was the same as A or B. As it happened, one of the players, a Sony CDP-650ESD, could be modified by replacing its internal-clock reference crystal with a Hewlett-Packard 8640B r.f.-signal generator, allowing its speed to be varied without affecting its audio characteristics. The Sony CDP-650ESD therefore became the reference device in each test, because it could be brought into sync with whichever other machine was being tested. An automatic-mute system cut the audio output of both players if they got out of sync, although synchronizing them initially required some fancy footwork on the part of technician Arthur Greenia.

In the initial round, some twenty listening tests were performed on each machine. The first five used a series of impulse signals from the Denon 38C39-7147 test CD, and they were followed by another series of five using white noise from the same disc. The next five tests used the thunderous "Star Tracks" CD from Telarc, which features massive orchestration and lots of bass (most of the listeners felt the speakers weren't up to the demands of the Telarc CD's low end). The final five tests used an intimate jazz recording by Warren Bernhardt, called "Trio '83," on the dmp Records label. The tests were run from a lab outside the

listening room: listeners communicated with the technicians by flailing their arms at a video camera linking the two rooms.

The primary tests were held on a Friday evening, when listeners auditioned all six machines (including the reference). There were eight listeners in the room, and while the danger that the listeners would interact and influence each other seemed to be real—there was considerable chit-chat, at least between selections—this didn't seem to have any significant effect on the test results. The next day, follow-up tests were conducted to clear up some questions from the night before and to confirm some of the results. Six listeners were involved in the second round, including three from the night before. All the tests were "double-blind"—neither the listeners nor the technicians knew which machine corresponded to the X button at any time during a test, thanks to the random selection performed automatically by the ABX comparator.

Six CD players were included in the sample. Two Sony units were chosen: the CDP-650ESD, a latest-generation, high-end (\$1,300) player (its ability to have its speed varied was a bonus), and the CDP-101, a first-generation unit that is reputed to have a distinctive audio character. The Technics SL-P3 (\$600) is a full-featured player from another leading Japanese proponent of the CD system, and the Emerson CD-150 is a relatively modest, inexpensive player (it often sells for less than \$200, though the list price is \$449). The Meridian MCD Pro is the basic Philips deck (Philips did start all this, after all) with some English electronic modifications and an exotic price tag (\$1,400). Finally, the American entry was the Carver DTL-100 (\$650), which is one of the few players to include circuitry designed to correct audible problems in some Compact Discs. What Carver calls a Digital Time Lens is an equalization/difference-signal correction circuit intended for use with CD's that have been improperly recorded, and the circuit should be switched out for properly made digital recordings.

As a preliminary step toward explaining any audible differences among the players that might turn up in the A/B listening tests, a series of frequency-response measurements was made using the Denon test disc. The effect of the Carver player's Digital Time Lens feature



*The Sony CDP-650ESD was the reference player to which the others were compared.*



*Poorly recorded CD's are said to sound better with Carver's Digital Time Lens.*



*The Technics SL-P3 earned high marks from Hirsch-Houck Labs in June 1985.*



*Some think Sony's first-generation CDP-101 sounds inferior to the latest models.*



*The Meridian MCD Pro is a high end British player much coveted by audiophiles.*



*The Emerson CD-150 is one of the least expensive CD players you can buy.*

was immediately apparent in its measured response. Switching the circuit on resulted in a 2-dB rise at the low end compared to the reference 0-dB point at 1,000 Hz, a dip of almost 2 dB at 3,000 Hz, and a rise to +4 dB at 18,000 Hz. Such deliberate manipulation would certainly be audible, but it does not indicate anything about the basic similarity of CD players without such modification.

With the Time Lens switched out, the Carver player came much closer to the sort of frequency response we would expect from a CD player: flat within 0.3 dB up to 18,000 Hz and within 0.1 dB up to 6,000 Hz. At the very top of the audio range, the curve fell to -1.6 dB at 20,000 Hz, but this drop would probably not be audible. The Emerson showed a similar drop at the top end as well as a peak of about 0.3 dB between 10,000 and 16,000 Hz; response was flat within 0.1 dB up to 10,000 Hz. The Technics showed a 0.3-dB peak above 16,000 Hz on one channel, 0.25 dB on the other, and the Sony CDP-101 exhibited a very gradual rolloff above 10,000 Hz, dropping to about -0.7 dB at 20,000 Hz. Both the Sony 650ESD and the Meridian were flat within  $\pm 0.1$  dB across the spectrum.

*The apparent "personalities" under certain circumstances of the Sony CDP-101, the "straight" Carver, the Meridian, and the Emerson do suggest that all CD players are not created equal.*

Except for the Carver player with its Digital Time Lens on, the measured frequency-response variations were extremely small, particularly when compared with those of most other audio components. Nevertheless, in terms of the subtle audible differences claimed to exist among CD players, they might have some significance.

It was not, of course, possible to perform similar basic measurements on the other variable in this testing process: the listeners themselves. It was possible, however, to look at the listeners' responses after the fact and identify any extreme inconsistencies. With the original group of eight listeners, the consistency was remarkable. We calcu-

lated "batting averages"—the percentage of correct choices in all the tests participated in—for each listener. The averages of the original eight ranged from .603 to .698, compared with an overall batting average of .637. As David Clark pointed out, "There were no Golden Ears found, and if there were any Tin Ears in the second round, they didn't take part in enough tests to show themselves." In any event, the first round of tests, which were performed at one sitting and under pressure to get through all the machines, produced much more consistent results than the less formal supplemental tests the next day.

No test procedure is perfect, but this series seemed to have filtered out as many unwanted influences as one could reasonably expect. So, what did the group hear?

The first unit to be auditioned was the Technics SL-P3. Until the panel's ears became attuned to what was happening, they strained to hear any difference whatever, but as the tests proceeded, there was some feeling that there was a slight difference in brightness between the Technics and the reference Sony. This difference was heard only on the impulse and noise portions of the test, however, and several listeners commented that if the differences were so hard to hear on pure test signals, they should be almost impossible to hear with music. And so it turned out—the length of time needed for each test increased as soon as the music came on, and brows furrowed noticeably. The consensus after it was over was that audible differences disappeared when a music signal was being listened to.

As it happened, the "differences" weren't there to begin with. In spite of the comments in the room at the time and on the panel members' response sheets, the choices were entirely random. In straining to hear some sort of distinguishing characteristic in the sound, the listeners believed they had done so, but their responses proved that no such characteristics were consistently found. Because this was the first session, and because the results were at variance with the panel members' beliefs, the Technics was retested the next day—again with entirely random results.

The second unit was the Emerson CD-150. The story seemed quite different in this case, and the listeners were visibly relieved to find real differences, however subtle. On the

## TEST DESIGN AND EQUIPMENT



**T**HE first question to be answered in the design of a scientific listening test is, *What are we trying to prove? In this case, we were trying to prove that some differences between CD players are audible. Even if we could prove that our listeners were not able to hear any differences between these CD players, we could never prove that some other group would be unable to hear differences. Perhaps different CD players, associated equipment, acoustics, or program material would make the differences audible. We therefore chose to restrict our goal to proving that at least one group or individual can hear a difference.*

*Every possible listener advantage was designed into this experiment. The listeners selected are audio hobbyists, most also having experience as musicians or recording engineers. The ABX double-blind comparator system was used to provide instant comparisons rather than waiting for patch cords to be swapped. Program material included exacting test signals as training for the carefully selected music CD's. Magnepan MG III speakers were set up in an acoustically treated listening room by Wendell Diller of Magnepan. In the adjacent "equipment" room, a Threshold S-500 II amplifier was monitored by oscilloscope to prevent clipping at any time. Program level was controlled by a Penny and Giles professional fader feeding a discrete-transistor gain and buffer amplifier. The CD player outputs were matched in level within  $\pm 0.05$  dB by custom-selected film resistors soldered, not switched, into the circuit for each player. Short runs of Hitachi LC-OFC interconnect and speaker cable were used throughout. One-way communication to the operator was provided by a closed-circuit TV camera trained on a blackboard in the listening room.*

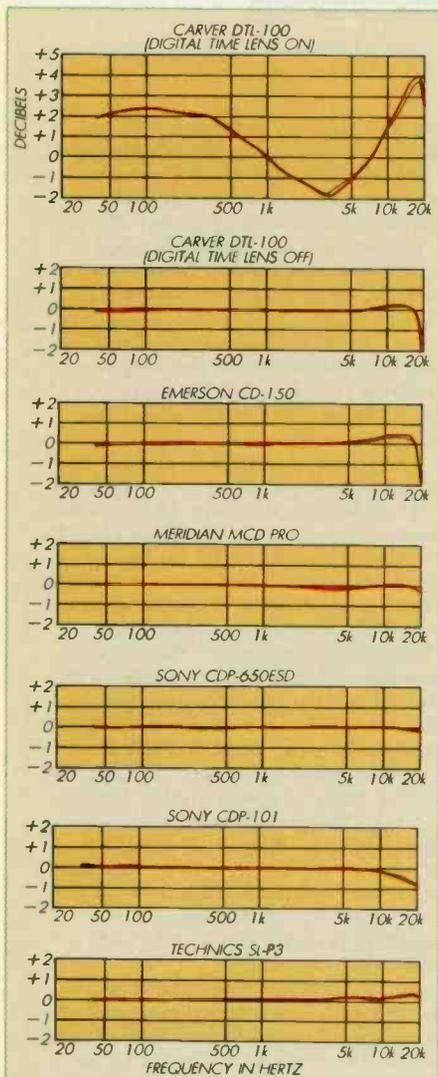
*Synchronization of the CD players was a major difficulty. If one player's signal were to lead or lag behind the other's, the listeners would be able to distinguish them on this irrelevant basis. Even if you start two players in sync, no easy task in itself, they will usually become noticeably out of sync in a few minutes. To overcome this, one unit, a Sony CDP-650ESD, was chosen to be the reference source in all*

*the tests. It was modified so that its speed could be matched with any of the other players. Once the two players were started in sync, changing the output frequency on the generator allowed "touching up" the synchronization with speed changes of less than 0.01 percent. An envelope-comparator circuit sampled left-channel outputs of the two CD players and automatically muted the audio to the listening room if an out-of-sync condition developed. Once the operator regained sync, the mute was reset.*

*The power of statistical analysis was fully utilized to uncover even "subliminal" audibility. With the ABX comparator, pure guessing will get you close to 50 percent correct, while 100 percent represents hearing certainty (or incredible luck). A score of 75 percent is commonly considered to represent the "threshold of audibility." But what if hundreds of responses yield a score of, say, 60 percent correct? Some small difference below the supposed hearing "threshold" must be responsible for a listener's doing better than chance. Statistical analysis can derive the probability (p) that a 60 percent score was due to random guesses. A probability of one in twenty ( $p = .05$ ) or less that the results were by chance is worth further study. A p of .01 (one in a hundred) is pretty secure proof that a difference was audible.*

*All this switching and statistics doesn't have much in common with the home listening experience. However, both home listening and our tests involve real people (as opposed to instruments), real sound systems, and real music program material. The double-blind test setup eliminates all but sonic differences and is a far more sensitive and repeatable indicator of performance than home listening. (Try to prove you hear a 0.3-dB response error in one unit using a casual plug/unplug test.) Nonetheless, since the two listening experiences are different, we should not expect audible differences to show up in the same way. A statistical confirmation of a difference heard in a four-hour test may relate to an audiophile's growing dissatisfaction over a period of months with "listening fatigue" or a nuance such as "ambiance retrieval."*

David L. Clark



An exaggerated vertical scale, with 1 dB per division instead of the usual 5 dB, is used to show subtle frequency-response differences among CD players. As a result, the intentional response modifications caused by the Carver player's Digital Time Lens appear to be somewhat more dramatic than they really are. The response of these players was measured with a Denon test disc that has a minimum frequency of 40 Hz. STEREO REVIEW's experience with CD player tests over the past three years suggests that it is safe to assume that all these players have flat response down to 20 Hz. (Red curves show the right-channel response, gray curves the left.)

NINA WALLACE

other hand, there was also surprise that there were any differences at all. The panelists generally expected to hear none, and they had been reassured by the difficulty of hearing any in the Technics test.

What they didn't realize was that in the first fifteen of the twenty tests on the Emerson, there was an inadvertent level difference of 0.2 dB. This level difference was consistently heard by the listeners, but the problem was corrected for the final five tests, and the results for that portion were entirely random. Again, we decided to retest this unit the next day. With music signals the randomness of choice remained, as it did with white noise at reasonably high levels. With low-level white noise, however, the choices became statistically significant, although only just, so the listeners *did* seem to be hearing some real audible difference under those circumstances.

The third unit to be auditioned was the Carver, with the Digital Time Lens switched in. A difference was immediately audible, as might be expected from the frequency-response measurements. Of the 160 individual choices made by the panelists, only four failed to identify the Carver. The next day, the player was tested again with the Time Lens circuitry switched out. This time the results were very much like the others—the differences, if any, were very difficult to detect. Overall, the listeners *did* hear a slight difference, but only by a very tiny margin.

The Meridian brought groans from the listeners, who wrote on their response sheets, and said afterwards during the pause between tests, that they heard absolutely nothing in the way of differences between it and the reference unit. Oddly enough, while their responses during musical selections bore this out, with pure test signals they showed a definite ability to distinguish the Meridian.

Finally, the Sony CDP-101 proved immediately and consistently identifiable during the impulse tests, but the responses became random when anything else was played, whether white noise or music. A subsequent check of the impulse response on an oscilloscope showed a considerable visible difference between the CDP-101 and the Sony 650ESD reference machine, and this may have been the cause of the audible difference.

Throughout the extended listening tests, it was clear that there were differences to be heard. The effects

of the Carver Digital Time Lens were readily explainable; this machine was chosen for test because it was designed to sound different, and it did. The effects of the misadjusted level on the Emerson show that a difference doesn't have to be very great to be perceptible, at least in a test session.

But neither of these unusual cases really answers the question of whether there are significant audible differences between CD players of conventional design, adjusted properly. The apparent "personalities" under certain circumstances of the Sony CDP-101, the "straight" Carver, the Meridian, and the Emerson do suggest that all Compact Disc players are not created equal. Indeed, with the results of the misadjusted Emerson and the Carver's Digital Time Lens ignored, the panel's ability to hear differences 57.6 percent of the time with test signals was statistically significant even though the listeners were not confident they were hearing any differences. These differences may, of course, simply result from their slight differences in frequency response, but that's enough to confirm the view of the "CD players sound different" faction.

At the same time, the listening tests confirmed that whatever the inherent differences, they are very small indeed. Even with pure test signals, it seems very unlikely that the differences could be heard except in a direct A/B comparison, and even then only in a comparison as carefully controlled as these tests were. With music, the numbers indicate that the scores were not significant, and it is difficult to imagine a real-life situation in which audible differences could reliably be detected or in which one player would be consistently preferred to another for its sound alone.

In the end, the main conclusion seems to be that audible differences do exist, but they don't matter unless you think they matter. Perhaps that will make everyone happy. □

David L. Clark is president of DLC Design, an electronic/acoustical consulting firm, and a director of the company that manufactures the ABX comparator. He is a contributing editor of Audio and has published technical papers in the Journal of the Audio Engineering Society. The AES recently elected him a fellow for his work in double-blind testing techniques. He is also a member of the Acoustic Society of America and the National Academy of Recording Arts and Sciences.

## STATISTICAL ANALYSIS OF ENTIRE PANEL'S SCORES

	PROGRAM MATERIAL	NUMBER OF CHOICES (CORRECT/TOTAL)	PROBABILITY THAT RESULT WAS DUE TO CHANCE*		PROGRAM MATERIAL	NUMBER OF CHOICES (CORRECT/TOTAL)	PROBABILITY THAT RESULT WAS DUE TO CHANCE*		OVERALL NUMBER OF CHOICES (CORRECT/TOTAL)	OVERALL PROBABILITY*	OVERALL CONFIDENCE LEVEL*
			CONFIDENCE THAT RESULT WAS NOT DUE TO CHANCE*	CONFIDENCE THAT RESULT WAS NOT DUE TO CHANCE*			CONFIDENCE THAT RESULT WAS NOT DUE TO CHANCE*	CONFIDENCE THAT RESULT WAS NOT DUE TO CHANCE*			
Test No. 1: Technics	Impulse signals	17/40	—	—	Test signals	31/80	—	—	62/142	—	—
	White noise	14/40	—	—							
	Orchestral music	22/40	.318	68%	Music	31/62	.550	45%			
	Jazz	9/20	—	—							
Test No. 2: Emerson	Impulse signals	26/40	.040	96%	Level difference of .20 dB	86/120	<.001	99.9%	109/160	<.001	99.9%
	White noise	36/40	<.001	99.9%							
	Orchestral music	26/40	.040	96%							
	Jazz	21/40	.437	56%							
Test No. 3: Carver (Digital Time Lens on)	Impulse signals	40/40	<.001	99.9%	Test signals	80/80	<.001	99.9%	156/160	<.001	99.9%
	White noise	40/40	<.001	99.9%							
	Orchestral music	37/40	<.001	99.9%	Music	76/80	<.001	99.9%			
	Jazz	39/40	<.001	99.9%							
Test No. 4: Meridian	Impulse signals	25/40	.077	92%	Test signals	50/80	.016	98%	92/160	.034	97%
	White noise	25/40	.077	92%							
	Orchestral music	21/40	.437	56%	Music	42/80	.369	63%			
	Jazz	20/40	.563	44%							
Test No. 5: Sony CDP-101	Impulse signals	28/40	.008	99%	Test signals	51/80	.009	99%	86/152	.062	94%
	White noise	23/40	.215	79%							
	Orchestral music	15/32	—	—							
	Jazz	20/40	—	—							
Test No. 6: Technics	White noise	15/30	—	—					27/59	—	—
	Jazz	12/30	—	—							
Test No. 7: Emerson	Loud white noise	18/30	.181	82%	Test signals	38/60	.026	97%	49/90	230	77%
	Soft white noise	20/30	.049	95%							
	Jazz	11/30	—	—							
Test No. 8: Carver (Time Lens off)	White noise	25/40	.077	92%					49/80	.028	97%
	Jazz	24/40	.134	87%							

\* Values are not shown when less than 50 percent of the choices were correct; the < symbol indicates less than.

## INDIVIDUAL LISTENER SCORES

LISTENER	OVERALL BATTING AVERAGE	PROBABILITY THAT RESULTS WERE DUE TO CHANCE*	NUMBER OF CHOICES (CORRECT/TOTAL)								OVERALL	
			TEST NO. 1	TEST NO. 2	TEST NO. 3	TEST NO. 4	TEST NO. 5	TEST NO. 6	TEST NO. 7	TEST NO. 8		
A	.698	<.001	7/17	14/20	19/20	17/20	10/19					67/96
B	.660	.001	9/18	14/20	20/20	13/20	8/19					64/97
C	.603	.014	8/17	12/20	18/20	11/20	9/19	6/10	9/15			73/121
D	.608	.021	7/18	12/20	19/20	9/20	12/19					59/97
E	.635	.005	6/17	16/20	20/20	8/20	11/19					61/96
F	.628	.002	8/17	14/20	20/20	15/20	10/19	4/10	9/15	6/16		86/137
G	.648	.001	10/18	15/20	20/20	10/20	13/19	3/10	8/15			79/122
H	.629	.007	7/18	12/20	20/20	9/20	13/19					61/97
I	.488	—							2/10	7/15	11/16	20/41
J	.550	.318							7/9	6/15	9/16	22/40
K	.610	.106							5/10	10/15	10/16	25/41
L	.813	.011									13/16	13/16

\* Values are not shown when less than 50 percent of the choices were correct; > symbol indicates greater than.

### NOTES:

In Test No. 1, the playback amplifier blew a fuse during Trial No. 18 (the third trial in the section using the jazz recording). The test was not completed, but some listeners had already made a choice in that trial. Thus, some listeners made a total of eighteen choices in Test No. 1, others only seventeen, for a panel total of 142 rather than the projected 160.

In Test No. 5, all of Trial No. 11 (in the orchestral-music section) had to be thrown out because the CD's went out of sync. Thus each panelist made only nineteen choices in this test, not twenty.

In Test No. 6, listener J could not decide in Trial No. 3, so he did not make a choice.

Test No. 8 had only two parts, and only five listeners participated. Therefore eight trials were run in each part, rather than the five trials in the other tests, in order to increase the choice totals and give greater statistical power to the results.

The overall batting average for the entire panel was .629, with 630 correct choices out of a total of 1001. For the original group of eight panelists, the overall batting average was .637, with 550 correct choices out of 863 total.

# BACH BUSTERS



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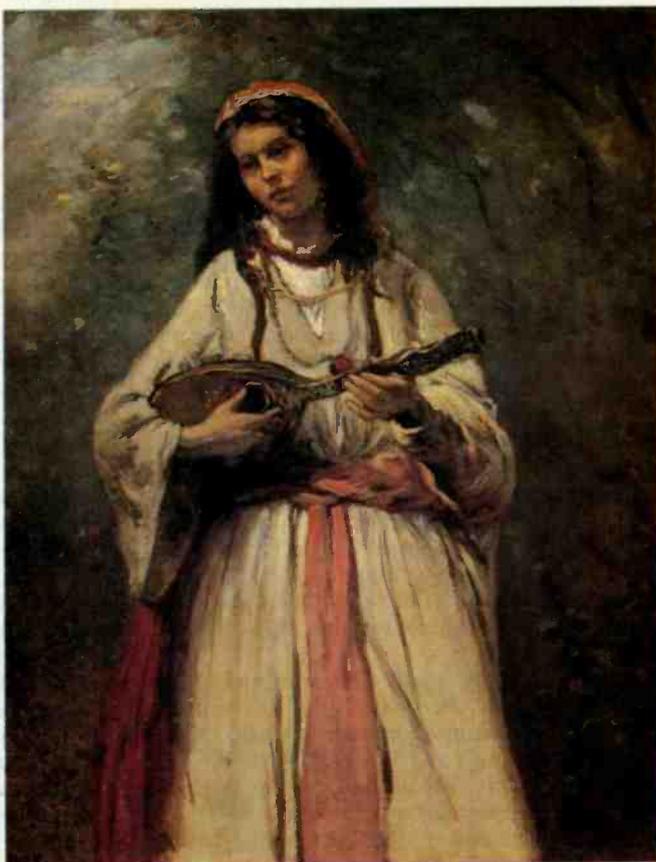
# CLASSICAL COMPACT DISCS

*Solo guitar and full symphony orchestra will sound better on CD.*

Classical record producers were the very first to adopt digital recording techniques, even before the Compact Disc system was put on the market. For several years, these producers made digitally recorded master tapes of performances that were then released on black vinyl LPs. Consequently, when the Compact Disc was launched commercially, classical companies had a sizable stockpile of digital recordings to offer to the public in the exciting new digital format.

In addition to their newer digital recordings, the classical companies quickly began to remaster a number of analog recordings to release on CD, and many of these turned out extremely well. The result is a classical catalog on Compact Discs that includes so many wonderful performances of excellent music in technically outstanding recordings that choosing the *best* twenty-five would be impossible.

In drawing up our list of twenty-five highly recommended classical CDs that are *among* the best, we have looked for technically impressive recordings of music that is of more than routine interest and performances that are of unusual merit. The range of musical styles available in CD form spans more than three centuries. Without attempting to make a historical survey, we've included music from different periods, as well as music that requires a vari-



*by William Livingstone  
& Christie Barter*

ety of performing forces—instrumental solo recitals as well as performances by large symphony orchestras with soloists and choruses.

Our list includes a few popular items, such as Beethoven's Fifth Symphony, but we've assumed that if you've got a CD player, you've probably bought Vivaldi's *Four Seasons* on CD, and thus we've tried to

bring your attention here to a few outstanding recordings that you might otherwise overlook.

By the way, if you don't have Vivaldi's *Four Seasons*, we recommend Angel's CD, with Itzhak Perlman as violin soloist and conductor of the Israel Philharmonic. If you prefer the sound of original instruments, try Trevor Pinnock and the English Concert (DG Archiv), Christopher Hogwood and the Academy of Ancient Music (L'Oiseau Lyre), or Andrew Parrott and the Taverner Players (Denon).

As we narrowed our list down to the twenty-five recommendations, we realized that we could very easily draw up another list of twenty-five recommended classical Compact Discs that would be equally distinguished. When we finished our listening sessions, we felt overwhelmed all over again by the truly fabulous sound offered by the Com-

compact Disc system. Having such advanced and marvelous technology placed at the service of art makes this a wonderful time for a music lover to be alive.

**Bach: *Tocatta and Fugue in D Minor; Concerto No. 2 in A Minor; Prelude and Fugue in B Minor; Prelude and Fugue in D Major.*** Michael Murray playing the organs at the First

*Gypsy Girl with Mandolin*, by Jean-Baptiste Corot, Courtesy of the National Gallery of Art.

Congregational Church, Los Angeles. Telarc CD-80088.

The beauty of Bach's familiar Toccata and Fugue in D Minor has opened the door to classical music for thousands of people. The other works in this organ recital are scarcely less accessible. If this is your first Compact Disc, you may be surprised at the amount of bass the low organ tones can bring forth from your speakers.

**Beethoven: *Piano Concertos Nos. 1-5.*** Rudolf Serkin (piano); Boston Symphony Orchestra, Seiji Ozawa cond. Telarc CD-80061-5, three discs.

One thing the Compact Disc has done is to spawn an uncommon number of "integral," or complete, sets of related works by a single composer. One of the earliest was Telarc's fine set of the Beethoven piano concertos performed by Rudolf Serkin and the Boston Symphony under Seiji Ozawa. It was also one of the earliest to take advantage of the CD's extended playing time by offering the five concertos on only three discs, with a break occurring only once, between the first and second movements of the First Piano Concerto. The performances are glorious, the freshness of Serkin's playing belying his years, and the recorded sound is absolutely first-rate. (Another set of the Beethoven concertos is off to an auspicious start with Claudio Arrau's *Emperor* on Philips.)

**Beethoven: *Symphony No. 5 in C Minor; Symphony No. 6 in F Major, "Pastorale."*** Berlin Philharmonic Orchestra, Herbert von Karajan cond. Deutsche Grammophon 413 932-2.

Beethoven's Fifth Symphony is to concert music what the *Mona Lisa* is to painting. The more cheerful "Pastorale" Symphony is almost as well known and loved. This Compact Disc presents two quintessential Central European symphonies played by the quintessential Central European orchestra led by the quintessential Central European conductor. The result is an exciting performance of two of the most popular works in the entire symphonic repertoire.

**Berlioz: *Requiem.*** John Aler (tenor); John Cheek (bass); Atlanta Symphony Chorus and Orchestra, Robert Shaw cond. Telarc CD-80109, two discs.

The Berlioz *Requiem* is one of those works that could almost have been written with the Compact Disc

in mind. It requires mammoth forces performing in huge spaces, and, at some points, seeming to come at you from every direction. The dynamics of Robert Shaw's stunning recording, enhanced by this true-digital release on CD, range from the awesome "Dies irae" to the exquisitely gentle closing of the "Offertorium." Atlanta's Symphony Hall is also big enough to give the recorded sound an airiness and clarity possible only on CD. The finesse and nobility of Shaw's performance make this more than just another sonic spectacular—although it surely is that—and the Prologue to Boito's *Mefistofele* and the Verdi *Te Deum*, which fill out the second disc, are both appropriate and offer good value.

**Bernstein: *Candide.*** Eric Mills (soprano), Cunegonde; David Eisler (tenor), *Candide*; others. New York City Opera Chorus and Orchestra, John Mauceri cond. New World NW 340/341-2, two discs.

Leonard Bernstein's *Candide*, which began life in the Fifties as a Broadway flop, has become a hit with New York City Opera audiences and looks as though it will remain in that company's repertoire for a good while to come. New World's splendid recording of that production vindicates all that the work's admirers have long held: that *Candide* is one of Bernstein's most original, inventive, and winning pieces of work for the theater. Eric Mills and David Eisler bring great flair to the principal roles, and conductor John Mauceri elicits all of the vivid color and snappy wit inherent in this magical score.

**Brahms: *Violin Concerto in D Major.*** Itzhak Perlman (violin), Chicago Symphony Orchestra, Carlo Maria Giulini cond. Angel CDC-47166.

This recording of the popular Brahms Violin Concerto was considered one of the Best of the Month when it was reviewed in the March 1978 issue of *Stereo Review*, and it is still probably one of the best recordings of this work in the catalog—on all counts. Itzhak Perlman delivers a robust, keenly felt performance under the poised (yet fully supportive) direction of Carlo Maria Giulini, and the analog recording leaves nothing to be desired in terms of clarity and balance. The transfer of this music to Compact Disc only makes it sound that much better.

**Eduardo Fernandez: *Recital.*** Works by Legnani, Giuliani, Diabelli, Paganini, and Sor. Eduardo Fernandez

(guitar). London 414 160-2.

The aim of good recording is to create the illusion that you are in the concert hall, or that the musicians are in your listening room. In many listening rooms, it is hard to imagine that large symphony orchestras or opera companies could be fitted into such small spaces. Since a solo acoustic guitar could actually be played in your listening room, no matter what its size, a well-recorded guitar recital can give a sense of startling reality. This CD provides that kind of fidelity to the real music. The debut recording of a young guitarist from Uruguay, the recital consists of a collection of beguiling 19th-century compositions that show off his dazzling technique.

**Glass: *Mishima.*** Original music composed by Philip Glass for the soundtrack of the film *Mishima*. Kronos Quartet; orchestra, Michael Riesman cond. Nonesuch 979113-2.

This music, written for the filmed biography of the Japanese novelist Yukio Mishima, may well be the most accessible work of the minimalist composer Philip Glass. In such compositions by Glass and his minimalist colleagues, modern concert music meets contemporary popular music of the kind termed new age. But you should forget about terms and labels, and simply enjoy the music. It is very compelling. Sonically, this recording reaches a level of quality approached by few others.

**Handel: *Messiah.*** Margaret Marshall (soprano); Catherine Robin (mezzo-soprano); Saul Quirke (boy soprano); Charles Brett (countertenor); Anthony Rolfe-Johnson (tenor); Robert Hale (bass). Monteverdi Choir; English Baroque Soloists, John Eliot Gardiner cond. Philips 411 041-2, three discs.

Handel's great oratorio does not lack for representation on Compact Disc (there were six versions listed at press time), but the most satisfying in our view is the recording conducted by John Eliot Gardiner, which was, in fact, the first to be released on CD some three years ago. Gardiner's approach is generally lighter in texture and more nimble in spirit than the others, but it's not without a compelling sense of drama in such sections as "The trumpet will sound" and "Why do the Nations." He also uses the sopranos of his own splendid Monteverdi Choir instead of boy trebles, which in no way detracts from the "authentic" orientation of the performance as a whole. The vocal

soloists, led by the soprano Margaret Marshall, are superb, and the recording itself favors the moderately scaled chorus and orchestra with an open, luscious sound quality and beautifully controlled balances.

**Mahler: *Symphony No. 1 in D Major* ("Titan").** Frankfort Radio Symphony Orchestra, Eliahu Inbal conductor. Denon CD 7537.

Characterized by wide dynamic range and strong contrasts in emotional content, Mahler's symphonies are long, sprawling, hyper-romantic works that require large orchestras. The First Symphony is a statement of the major subjects—his love of nature and his thoughts on death—that were to preoccupy this composer throughout his entire creative life. Denon's recordings of these symphonies have furthered Inbal's reputation as a Mahler specialist.

**Mahler: *Symphony No. 2 in C Minor* ("Resurrection"); "Kindertotenlieder."** Sheila Armstrong (soprano); Dame Janet Baker (mezzo-soprano); Edinburgh Festival Chorus; London Symphony Orchestra and Israel Philharmonic Orchestra, Leonard Bernstein conductor. CBS M2K 42195, two Compact Discs.

One of Leonard Bernstein's greatest achievements while he was regularly conducting the New York Philharmonic was putting Gustav Mahler on the musical map as a mainstream symphonic composer. The Second Symphony has been a staple in Bernstein's repertoire for many years, and this recording, made in the mid-Seventies, is still one of the most eloquent in the catalog. Listening to it on CD can be an intensely moving experience, especially at it is capped here by the radiant singing of Janet Baker in the final two movements. A considerable bonus in the CD package is Dame Janet's rendering of Mahler's "Kindertotenlieder," an appropriate and logical filler that makes for good value.

**Mozart: *Così fan tutte*.** Rachel Yakar (soprano), Fiordiligi; Georgine Resnik (soprano), Despina; Alicia Nafe (mezzo-soprano), Dorabella; Gösta Winbergh (tenor), Ferrando; Carlos Feller (baritone), Don Alfonso; Tom Krause (bass), Guglielmo; others. Chorus and Orchestra of the Drottningholm Court Theater, Arnold Östman conductor. L'Oiseau Lyre 414 316-2, three Compact Discs.

This new recording of Mozart's *Così fan tutte*, a silver cloud of an opera with a dark lining, was made at

the jewel-like Drottningholm Court Theater, a short boat ride from Stockholm, where Arnold Östman has been conducting a summer festival concentrating on "authentic" opera revivals. His realization of this score is more finely spun than usual, but still carries a good deal of emotional weight along with its moments of pure knockabout. The stage and the theater itself are small (the seating capacity is some 450), but the recording sounds in no way cramped. In fact, the bright, transparent sound of the period instruments and the gleaming finish of the singing should win over a lot of listeners who would ordinarily claim they don't like the sound of so-called authentic performances of early music. The force of Mozart's genius in this glorious music is, of course, its own justification.

**Mozart: *Quintet for Piano and Winds in E-flat Major* (K. 452). Beethoven: *Quintet for Piano and Winds in E-flat Major*, Op. 16.** Murray Perahia (piano); members of the English Chamber Orchestra. CBS MK 42099.

The Mozart quintet is one of his most original and sublimely inspired works. The Beethoven, written a dozen years later in 1797, is a youthful effort intended, scholars suppose, partly as an homage to the earlier masterpiece and partly as a rival in a limited repertoire—that is, music for piano and four winds (or the usual wind quintet without the flute). Murray Perahia and his colleagues here sail through both works with the vigor and sense of style to put this recording at the head of its class. The clean articulation and balance of instrumental timbres make this a pretty special CD.

**Mozart: *Divertimentos in D, B-flat, and F; Serenade in D Major* ("Serenata notturna").** I Musici chamber orchestra. Philips 412 120-2.

These charming three-movement serenades or divertimentos were probably written as background music for parties in the homes of the rich people of Salzburg, where Mozart grew up. Today, they can hold your attention if you move them to center stage, or they can be put to elegant use in the background at your parties. The *Serenata notturna* (1776) is one of Mozart's most attractive youthful works.

**Offenbach: *La belle Hélène*.** Jessye Norman (soprano), Hélène; John Aler (tenor), Pâris; Gabriel Bacquier (baritone), Agamemnon; Jean-Philippe Lafont (bass), Calchas; others.

Chorus and Orchestra of the Capitole de Toulouse, Michel Plasson conductor. EMI/Angel CDCB-47156, two Compact Discs.

Offenbach is best known in the opera house for *The Tales of Hoffmann*, which is a fairly serious work. *La belle Hélène*, on the other hand, is one of the many comic pieces on which this composer built his reputation in the mid-1860s. The recording is fabulous, in every sense, and everyone involved in the performance seems to be having a perfectly wonderful time. Jessye Norman as Helen (of Troy, that is) tends to be a little too "operatic" at times, but her vocal agility and charm, tinged with just a hint of naughtiness, are completely winning. Another American, the tenor John Aler, is delightful as Paris, negotiating the role's vocal pyrotechnics with apparent ease. The otherwise predominantly French forces under Michael Plasson's nimble direction are at all times a joy to hear. They have been beautifully recorded by EMI's engineering team, who seem to have had an fun-filled holiday in Toulouse.

**Pachelbel: *Canon & Gigue*.** With works by Handel, Vivaldi, Albinoni, and others. The English Concert, Trevor Pinnock (harpsichord and conductor). DG Archiv 415 518-2.

The Baroque Era in music stretches from about 1600 to 1750, embracing the work of many of the greatest composers in Western history. During the last several decades, this music has enjoyed a vigorous revival with scholars, performers, and audiences. This Compact Disc is a collection of some of the all time greatest Baroque hits. Containing Pachelbel's famous "Canon," as well as Handel's popular "Arrival of the Queen of Sheba" and works by Haydn, Purcell, and others, the album is a more than generous Baroque sampler played by Pinnock and the English Concert, who have been leaders in the movement to go back to original instruments and authentic performance practices.

**Ravel: *Piano Concerto in G Major; Piano Concerto for the Left Hand*.** Jean-Philippe Collard (piano), Orchestre National de France, Lorin Maazel conductor. EMI-Angel CDC-47386.

One of the nice things about being a composer-pianist is that you can write a piece for yourself that will show your keyboard talent to its best advantage. Ravel did just that with his glorious G Major Piano Concer-

to, which he wrote between 1929 and 1931. At the same time, he was also working on a concerto for the pianist Paul Wittgenstein, who had lost his right hand in World War I. The latter is truly a virtuoso piece, though darker in mood than the G Major, and presents a challenge that Jean-Phillipe Collard meets with aplomb—and dazzling technique—in this EMI-Angel recording with Lorin Maazel and the Orchestre National de France. Collard is equally fine in his reading of the G Major Concerto, making this the best coupling of these two works on Compact Disc. It offers more than the others, too, with the addition of two of Ravel's solo pieces—the famous "Pavane pour une infante défunte" and the glittering "Jeux d'eau"—played by Collard. Also included on this disc is the seldom-performed two-piano version of "La Valse," in which he is accompanied by Michel Beroff.

**Carol Rosenberger: *Water Music of the Impressionists*.** Works by Liszt, Griffes, Ravel, and Debussy. Carol Rosenberger (piano). Delos D/CD 3006.

In addition to being an internationally known pianist, Rosenberger has become a producer of piano recordings for the Delos label. A pioneer of digital recording, Delos is known to be especially successful in capturing the sound of the piano, and Rosenberger has no doubt been influential in that regard. Here, her elegant performances of this collection of Impressionist compositions describing different forms of water resulted in a recording that has been a perennial favorite to demonstrate the virtues of the Compact Disc. And the music is delightful to the ears as well as enjoyable to the soul.

**Rossini: *Stabat Mater*.** Katia Ricciarelli, Lucia Valentini Terrani, Dalmacio González, Ruggero Raimondi. Philharmonia Orchestra, Carlo Maria Giulini conductor. Deutsche Grammophon 410 034-2.

The first of the triumvirate of great Italian opera composers of the *bel canto* period (which also included Donizetti and Bellini), Rossini retired from operatic composition when he was only 37. The *Stabat Mater*, a tribute to the Virgin Mary, was completed when he was almost 50. It has been insufficiently appreciated, perhaps because Rossini's operas overshadowed his sacred music. In any case, it is a masterly work, and Giulini elicits performances from the

soloists and orchestra that have exactly the right combination of spirituality and dramatic excitement.

**Schubert: *String Quintet in C Major* (D. 956).** Alban Berg Quartet with Heinrich Schiff (cello). Angel CDC 47018.

The last of Schubert's great chamber-music masterpieces and one of the last works he completed before his death at the age of 31, this quintet is sublime. It provides nourishment for the mind, the heart, and the spirit, and its mystical quality generally calls forth the best efforts from the string players who perform it. The Berg Quartet and cellist Heinrich Schiff are among the finest young players in Europe today, and they give their all in performing this beautiful composition.

**R. Strauss: *Suite from Der Rosenkavalier; Symphony Fantasy from Die Frau ohne Schatten*.** Detroit Symphony Orchestra, Antal Dorati cond. London 411 893-2.

The melodies included in the suite from Strauss's popular opera *Der Rosenkavalier* are familiar, but the symphonic fantasy from *Die Frau ohne Schatten* is made up of less well-known musical materials. Both are lush works for large orchestra, and both receive masterly performances on this recording. The opulence of the recorded sound is matched by few other Compact Discs. Maestro Dorati announced his retirement on his eightieth birthday (April 9, 1986). This CD is one of the crowning achievements of his long and distinguished recording career.

**Scarlatti: *Sonatas*.** Alexis Weissenberg (piano). Deutsche Grammophon 415 511-2.

Scarlatti, whose three-hundredth birthday was celebrated in 1985, spent most of his creative life as music master at the royal court of Spain. He wrote more than 600 compositions for harpsichord and is considered the founder of modern piano technique. Weissenberg plays this program of sonatas with great skill. There is a considerable variety in mood and execution of the pieces that make up the recital, even a dash of Spanish flavor here and there. This disc demonstrates the ability of Compact Discs to render fine detail and subtle gradations of dynamics. An exquisite album.

**Stravinsky: *Symphony in C Major; Symphony in Three Movements*.** L'Orchestre de la Suisse Romande,

Charles Dutoit cond. London 414 272-2.

Two works that go well together on the same disc are Stravinsky's *Symphony in C*, which he completed soon after he arrived in America in 1939, and his *Symphony in Three Movements*, which he wrote while living in Hollywood during World War II. And they have often been coupled, but never so well played as they are here. The sound captured by the London/Decca engineers puts this Compact Disc in the demonstration class.

**Tchaikovsky: *The Nutcracker, Op. 71*.** St. Louis Symphony Orchestra, Leonard Slatkin cond. RCA RCD2-7005, two Compact Discs.

At press time, there were nine versions of the complete *Nutcracker* ballet on LP and cassette, but only one of them was available on Compact Disc: the lithe, warmly affectionate performance by the St. Louis Symphony under the direction of Leonard Slatkin. Slatkin has done wonders in St. Louis, and the orchestra sounds at its very best in this wide-open, well-performed, exquisitely engineered recording.

**Verdi: *Falstaff*.** Renato Bruson (baritone), Falstaff; Karia Ricciarelli (soprano), Alice Ford; Barbara Hendricks (soprano), Nannetta; Lucia Valentini-Terranti (contralto), Mistress Quickly; Leo Nucci (baritone), Ford; others. Los Angeles Philharmonic Orchestra, Carlo Maria Giulini cond. Deutsche Grammophon 410 503-2, two discs.

This performance of *Falstaff*, Verdi's sunniest score and his last opera (1893), marked the return of Carlo Maria Giulini to live opera-conducting after a hiatus of fifteen years. The vocal characterizations that he draws from his all-star cast (headed by Renato Bruson) are wonderfully vital, full of high spirits and sudden flashes of temperament. Bruson avoids playing the role for its buffoonery and brings to it a sense of irony and a sort of rueful mellowness that are totally compelling. The Los Angeles Philharmonic, which Giulini briefly served as music director, plays like a dream, and the recording itself, made at the Dorothy Chandler Pavilion in LA, is a stunning example of what can be achieved under the less-than-ideal conditions of a live performance. In sum, this recording takes its place alongside the handful of others recognized as landmarks in the field of opera on discs—all discs, LP and CD. □

25 Best

# POP COMPACT DISCS

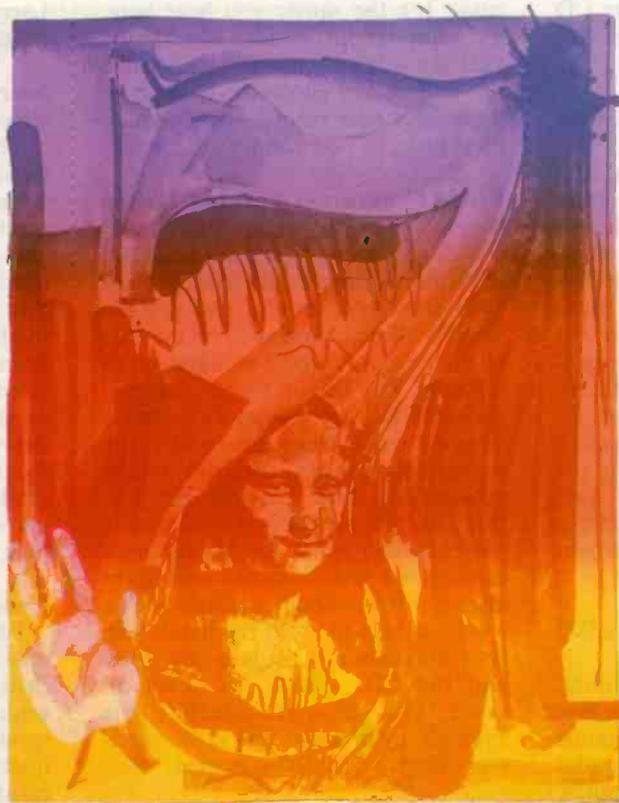
*A rock critic recommends some of the popular CDs he has known and loved.*

Coming up with a list of the 25 best anythings is a hopelessly subjective venture under the best of circumstances, but for a rock critic picking pop CDs, the difficulties are almost hellish. How, in good conscience, can you recommend a disc that sounds fantastic if you really aren't goofy about the music? And if strictly state-of-the-art sonics is your criterion, won't that mean your list includes nothing recorded before last year? And so on.

My solution to these and other dilemmas has been to pick discs for no other reason than that I like them, although I have included a couple of high-tech exceptions and a couple of things from the Mesozoic Era (late Sixties, early Seventies) to remind people that music was not invented by MTV. Astute readers will rightly note the lack of rhythm and blues here, for which I apologize upfront. In principle, I am not crazy about the kind of ghetto-ization that this implies, but I think for our purposes we can all agree that r-&-b deserves a separate list in a future buyers' guide. In the meantime, enjoy.

**Wish You Were Here:** Pink Floyd (Columbia).

The Floyd, during either their early birds-chirping-in-the-night or later our-childhoods-were-nightmares periods, have never been my favorite band, but there's no denying their



by Steve Simels

consummate craftsmanship in the studio, and this album, probably the only one they ever made with a subject worth the effort (the tragic drug burnout of their founding member Syd Barrett) is quite genuinely moving. Though by today's standards it's somewhat under-produced (funnily enough, it sounds more like chamber music than I remembered) it's still a super piece of record-making and the CD has tremendous sweep and

unequaled clarity of sound.

**The Three Faces of Al:** The Firesign Theater (Rhino).

The Firesigns, or the Beatles of Comedy as they've been dubbed, have always been keenly aware of the potential of the recording studio. This, the first comedy album released on CD, is no exception. It's not as utterly surreal as some of their other efforts, but considering how thoroughly the tough guy private eye genre has been parodied over the years (including earlier excursions by the Firesigns themselves), this pun-filled adventure of the indomitable Nick Danger, Third Eye is gratifyingly yok-inducing, and the analog sound is superb. In fact, if radio had sounded as good as this CD, they wouldn't have had to invent television.

**Who's Next:** The Who (MCA).

Glyn Johns, who produced this, is one of the real unsung heroes of rock-and-roll. A guy who's been making records since 1962, his albums have always been among the biggest sounding and impressive around. This effort, besides featuring some of the Who's best songs, more or less wrote the book on high-gloss production techniques in the first half of the Seventies, and it has dated hardly at

*Color Numerical Series: Figure 7, by Jasper Johns, Courtesy of the National Gallery of Art.*

all. The CD version has a hint of tape hiss that was undetectable heretofore, but sounds otherwise magnificent.

**Emerson Lake and Powell: Emerson Lake and Powell (PolyGram).**

Yes, it's pompous; yes, they rape Gustav Holst as thoroughly as they earlier raped Moussorgsky; and yes, Greg Lake's lyrics reveal him yet again as perhaps the worst undergraduate poet in the history of rock-and-roll. Despite all that it must be noted that drummer Cozy Powell can keep a beat (a claim which could never be made of Carl Palmer, who formerly provided the P in the group's monogram) and that, strictly as ear-wash, the whole business here sounds as grand as the New York Philharmonic attacking Mahler's "Symphony of a Thousand." Which is a grudging way of saying that this here CD makes an extremely impressive demonstration disc.

**Cosmo's Factory: Creedence Clearwater Revival: (Fantasy).**

With the benefit of hindsight, it is now clear to most reasonable folks that Creedence was the great American rock band of its day, and on balance this is probably their best album. It's certainly the best engineered. What this CD version makes especially apparent is how artfully their stuff was under-produced. Overdubs are at a minimum, everything is exceptionally clean-sounding and on some tracks, particularly the rockabilly stuff like "My Baby Left Me," what you hear is essentially a live band in an acoustic environment that suggests your living room.

**Abbey Road: The Beatles (EMI Japan).**

This was the production triumph of both the band's career and the Sixties as a decade, a benchmark against which almost all subsequent studio rock has been measured ever since. Here in 1986, on a hard to get Japanese import CD, it sounds even more astonishing than you might remember. How, to paraphrase the Hunts' Tomato Paste ads, did they get all those sounds onto that itty bitty 16-track machine? Dunno, but get them they did, and while some of the music had dated (by Beatle standards, that is) this is still the kind of album that can make your jaw drop from the sheer opulence of it all. One of the great sonic wallows of all time.

**EB 84: The Everly Brothers (Mercury).**

Dave Edmunds, who covered him-

self in glory masterminding this long-awaited comeback album by the Everlys, is a great producer, but extremely stylized. His records don't sound like anybody else's; in fact, by contemporary standards they're somewhat cramped from an audiopurist perspective, including *EB 84*. Nevertheless, the better cuts here simply jump out of your speakers, and this CD version is by far the best way to hear Edmonds' unique and uncommonly vivid approach to the mixing board.

**Synchronicity: The Police (A&M).**

Overfamiliarity has not dimmed the appeal of this pop masterpiece one whit, and as with the Everly Brothers album, at least part of its appeal accrues from its production, which is similarly stripped down and basic. It's the music you hear here, not some producers' idea of what the kids are listening to, and the results are undeniably gorgeous: if none of these guys ever record another note, their place in pop history is secure.

**Little Creatures: Talking Heads (Sire).**

I don't know if it's coincidental that *Little Creatures*, the Heads' most "conservative," tuneful and pop-accessible effort, happens to be the first of their records that I've liked unreservedly, but David Byrne's estimable material aside, what I've always admired most about this band is the deceptively simple, precision-tooled authority of their playing. For me, then, the real pleasure of *Creatures* is the ensemble work, the Heads functioning as a self-contained unit again after a several-album masquerade as a sort of post-modern big band. The instrumentals are really a joy here, and the CD version lets them all come through—particularly Chris Frantz's cymbal work—with exemplary clarity. Not to be missed.

**Hounds of Love: Kate Bush (EMI).**

Bush, for good or ill, is the world's greatest living Pre-Raphaelite rock star, and there's no denying that her 19th century literary affectations and "Sgt. Pepper Goes Eighties" production style can border on the ludicrously overripe. Still there's something weirdly compelling about her stuff, and with this album (recorded, appropriately enough, at Abbey Road studios) on tracks like "Big Sky" and "Running Up That Hill," her everything-but-the-kitchen-sink approach can really get to you, even if she's an acquired taste you haven't yet acquired. The percussion effects on

"Sky" alone make this CD a worthwhile purchase.

**The Unforgettable Fire: U2 (Island).**

Lead singer Bono may get most of the press attention (some of which, given his recent increasingly messianic stance, may be going to his head) but the main reason a lot of people think U2 is the best rock band out of Ireland since Van Morrison's Them is guitarist the Edge. Face it: this guy has the first really original approach to his instrument (in a rock context) of anybody since the early Seventies. On the CD version of *Fire*, arguably their best album, Edge comes over, thanks to hero producer Brian Eno, as the aural equivalent of a Gothic cathedral, and the delicacy and understatement of the bass and drum team of Adam Clayton and Larry Mullen are pretty darned impressive, too.

**Scarecrow: John Cougar Mellencamp (Riva).**

This is an uncommonly strong collection of songs, to be sure, but notwithstanding Mellencamp's canny mixture of newly believable rock-and-roll populism and stick-in-your-head melodic hooks, the real star of this album is, once again, an unorthodox production approach. The drums, courtesy of the vastly underrated Kenny Aronoff, function almost as the lead instrument here, and the trebly snap of the backbeat as fixed on tape by Mellencamp and producer Don Gehman is like nothing else to be heard these days, in rock or elsewhere.

**Quadrophenia: The Who (MCA).**

Pete Townshend's gritty, motor-bike realist look at the mid-Sixties British mod subculture has never achieved the popularity of his more mystical rock opera *Tommy*, but in many ways it's a more impressive accomplishment, and on a purely technical level it's considerably more sophisticated than its celebrated predecessor. The CD version, meanwhile, is truly overwhelming; if the rainstorm effects on "Love Reign O'er Me" don't fool you into thinking your roof has sprung a leak, then there's probably something wrong with your stereo system. And the music's pretty great, too.

**Bob Till You Drop: Ry Cooder (Warner Brothers).**

"Rock's First All-Digital Recording," as it was billed back in 1979, was something of a revelation then, and hearing it again on CD in 1986 is

almost equally revelatory. By comparison, my LP version sounds as if it were recorded with a sock over it. Sonics aside, however, this is one of the most interesting roots-oriented rock records of recent years, and while there is occasionally a slight whiff of the academic about it, on tracks like "Little Sister" and "I Think It's Going to Work Out Fine," Cooder and his superb little band, including David Lindley on extremely sympathetic second guitar, make music that is as deeply felt as any you are likely to hear anywhere.

**Greatest Hits: The Cars (Elektra).**

The Cars, of course, are one of the greatest con acts in recent musical history. Any band that can convince the general public that songs derived from old Ohio Express bubblegum hits are somehow avant-garde is clearly qualified to sell ice to Eskimos. Given that, however, the Cars' songs are in fact fully as appealing as those old Ohio Express bubblegum hits (sometimes even more so, as witness the sublime "You Might Think") and the sound of all this ear candy, courtesy of gargantuan over-producer Roy Thomas Baker, is among the most impressive (albeit thoroughly unrealistic) around. Silly stuff, and I love it.

**90125: Yes (Atco).**

A lot of people I know continue to insist, against all the recorded evidence, that this band makes the music of the spheres, a claim I will not dispute at this juncture except to point out that anybody who titles an album after its catalogue number is probably a little bit deficient in the imagination department. This particular album, however, does feature an exceptionally opulent production by high-tech honcho Trevor Horn (best known for making Frankie Goes to Hollywood sound like actual musicians), and on the likes of "Owner of a Lonely Heart" the aural perspective he's provide the Yes-men is so impressive I'm almost disposed to overlook the essential banality of the whole business... especially on this really splendid sounding CD.

**Dog Eat Dog: Joni Mitchell (Geffen).**

Considering her old-folkie background, Mitchell's albums have always been interesting from a production standpoint, and this latest, done in collaboration with synthwizard Thomas Dolby, is probably the most lavish and over-the-top of her career. Mitchell's music here, explicitly political and even more eccentric than

usual, is forced to compete with the sounds of cigarette machines, burglar alarms, and even Rod Steiger as a Falwell-like evangelist; it is a credit to all concerned that the songs emerge unscathed from underneath the aural glitz. All in all, one of the most adventurous records from a major artist to have been released in far too long, and the CD version sounds like a million bucks—which may not be hyperbole, given the possible production costs.

**Different Light: The Bangles.**

Some cynics claim my enthusiasm for this album stems from my mad crush on bassist Michael Steele, to which I reply: horsefeathers. Simply put, this is the most adorable update of the Byrds/Hollies/Beatles jungle-jangle-twelve-string-with soaring-harmonies sound currently available before an increasingly jaded public, and if "If She Knew What She Wants" doesn't make you swoon, then you're probably brain dead.

**The Principle of Moments: Robert Plant (Swan Song).**

In the context of Led Zeppelin, Plant always struck me as something of an aural cartoon, and I never took him particularly seriously; he had one of those freak, only-dogs-can-hear-him English voices and who really cared? Since he's gone solo, however, it turns out he's a far more interesting singer than I gave him credit for, and on this second solo album he runs through a set of moodily atmospheric numbers on which he functions (quite brilliantly, actually) as more of a lead instrument than a vocalist. Impressive stuff, and the sound on this CD—courtesy of producer Pat Moran and the hero staff of the Welsh Rockfield Studios—is among the cleanest representations of a basic hard-rock band yet.

**Making Movies: Dire Straits (Warner Brothers).**

**Brothers in Arms: Dire Straits (Warner Brothers).**

**Local Hero: Mark Knopfler (Warner Brothers).**

As you may have gathered from the above, I am something of a sucker for Mark Knopfler's trademark brand of "Layla"-derived guitar heroics, Dylanesque mumbling, and atmospheric songwriting... so much so, in fact, that I am also inclined to overlook his occasional ersatz-Springsteenian bombast and lyrical petulance. All things considered, these three CD's contain his best music. *Movies*, courtesy of producer

Jimmy Iovine, is the biggest and most impressive sounding: *Local Hero*, which is largely instrumental, is the most romantic and evocative; and *Brothers in Arms*, a digital recording, the most tuneful and grabby. But all three are terrific, and among the first CDs I'd recommend to anybody.

**Across A Crowded Room: Richard Thompson (Polydor).**

Thompson, the guitarist and songwriter who's been described with some justification as the Sixteenth Century Jeff Beck, is one of those rare cult figures who lives up to his notices, and this, his most recent album, while not, on balance, his best, will at least give you an idea of what he's capable of. The combination of his gruffly expressive vocals, achingly intense guitar workouts, and chillingly despairing lyrics is among the most overwhelming experiences currently available in rock-and-roll and since the sound of this (his first) CD is gratifying vivid, it is needless to say highly recommended.

**Beggar's Banquet: The Rolling Stones (London Import).**

*Banquet*, among the two or three finest records of the Stones' seemingly endless career, was also first produced (by the brilliant Jimmy Miller) under what might be called modern conditions. Even today, nearly twenty years later, there are few albums around on which the guitars and drums hit you with such snarling, primal intensity, and unless you're totally bored with the very idea of the Stones, I can't imagine you wanting to be without it. The import CD version, with its superior stereo imaging and increased dynamic range, is an exemplary mastering job, better even than Mobile Fidelity's audiophile LP version, and it's definitely worth looking for.

**In Visible Silence: The Art of Noise (Chrysalis).**

Perhaps the most impressive demonstration of the potentialities of synthesized sound to date, this studio creation of a renegade bunch of heavyweight English sidemen is an icily perfect tour-de-force, perhaps the closest things to genuine machine music yet. My colleague Mark Peel got it right when he called it a cheap thrill. It's also sort of funny. Is it Art? Is it a taxi? I wouldn't venture to guess, but it's probably the sound of things to come, and the CD version will test the outer limits of your stereo system and beyond. □

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DVD

25 Best

# JAZZ COMPACT DISCS

*Although the selection is limited, great jazz performances are available on CDs.*

The long-playing record has been with us for forty years, but we have yet to see every jazz record reissued in that format. Now, the Compact Disc has eliminated the probability of that ever happening. Will we eventually be able to buy our favorite morsels of recorded jazz history on CDs? Yes, at least the classic sides, and probably also a vast amount of obscure items, but don't hold your breath.

For one thing, the laser reproduction is good to a fault. A tape splice obscured in the vinyl pressing process can become a rude interruption on a CD, so even recent analog recordings suffer in transformation to the laser technology. Consequently, we have already seen some disappointing CD reissues of LPs, but, as the transfer technology is refined, much of the extraneous noise will become history, and such overly noisy CDs as RCA's *The Unforgettable Glenn Miller* (RCA) and Miles Davis's wonderful *Sketches of Spain* (Columbia) will be properly remastered.

Record companies will, for some time to come, largely use technical considerations as a criteria for CD jazz reissues, only digging deep into the vaults for the most significant sides of the past. Add to that a relatively complex and slow manufacturing process, and you will understand why the selection of available jazz CDs continues to be limited.

Given the circumstances, the task of compiling a true list of the twenty-



by Chris Albertson

five best jazz Compact Disc releases becomes an impossible one. Considering the vast catalog of jazz recordings made since 1917, relatively few releases have so far appeared in the CD format. Of these, few review copies are available, because most CDs are still being imported from a handful of factories in Europe and Japan, and many record companies don't even have their own releases in stock (we actually purchased some of our "review" copies in local shops). Sound reproduction being an important consideration in compiling this list, I have had to bypass numerous excellent albums simply because I was unable to hear them on Compact Disc. The following list—which appears in no particular order—is, therefore, solely based on what I have actually heard on CD, and should be regarded only as 25 recommended albums.

**Conversations:** L. Subramaniam/Stephane Grappelli. L. Subramaniam (violin, viola, Violectra, tambura, and surmandal); Stephane Grappelli (violin, piano); others. Milestone FCD-622-9130.

This album teams up two of the finest jazz violinists around: L. Subramaniam, a young relative newcomer from India, and Stephane Grappelli, the septuagenarian veteran of the famous Hot Club of France. What a perfect match they are! If this is what the fusion trend has wrought, I am all for it—a splendid fusion of talent,

taste, and stunning virtuosity. This CD is filled to the brim with engaging ensemble work, driving solos, and beautiful sounds.

**Duke Ellington and Johnny Hodges Play the Blues Back to Back:** Duke Ellington/Johnny Hodges. Johnny Hodges (alto saxophone); Duke Ellington (piano); Harry Edison (trumpet); Les Spann (guitar); Al Hall (bass); Jo Jones (drums). Verve 823637-2.

The two jazz giants had played together for many years, but never before had they conversed on such personal terms as on *Duke Ellington and Johnny Hodges Play the Blues Back to Back*, a 1963 release that teams them up with men who have been more closely associated with the Count Basie band. A follow-up album, *Side By Side*, was less success-

*Still Life*, by Pablo Picasso, Courtesy of the National Gallery of Art.

ful; this one captures it all, an intimacy that makes it a perfect CD candidate. Trumpeter Harry Edison and guitarist Les Spann add to the mellowness, and drummer Jo Jones is as elegant as ever. "Weary Blues" is particularly engrossing, but this is all splendid stuff.

**Dinah Jams: Dinah Washington.** Dinah Washington (vocals); Clark Terry, Clifford Brown, Maynard Ferguson (trumpets); Harold Land (tenor saxophone); Junior Mance (piano); Keeter Betts, George Morrow (bass); Max Roach (drums). Emarcy 814 639-2.

This is one of two noteworthy albums that resulted from a much talked-about 1954 Hollywood marathon session. Not only was it a meeting of stars, it also combined the past and the future: Dinah Washington was already the reigning "Queen of the Blues"—a title previously held by Bessie Smith—and the jazz world was buzzing with talk of the newly formed Clifford Brown/Max Roach Quintet. They met in the kind of informal setting that professional equipment rarely recorded—and the result justified the prevailing air of anticipation. This CD release underscores that justification.

**Good Bait: Bobby Hutcherson.** Bobby Hutcherson (vibraphone); Branford Marsalis (soprano and tenor saxophones); George Cables (piano); Ray Drummond (bass); Philly Joe Jones (drums). Landmark VDJ 1020.

Vibraphonist Bobby Hutcherson has yet to be accorded the public recognition his talent deserves. Here his mettle shows, as he leads a quintet completed by saxophonist Branford Marsalis (who, unfortunately, continues to play in the shadow of his celebrated brother), the superb pianist George Cables, bassist Ray Drummond, and drummer Philly Joe Jones. Together they produce a tightly knit sound that gives body and mind a workout, and takes full advantage of the Compact Disc's technology. One track—Thelonious Monk's "In Walked Bud"—is worth the entire price of admission.

**Benny Goodman and Friends: Benny Goodman.** Benny Goodman (clarinet); others. London 820-179-2.

The album cover reveals little about this set of Benny Goodman combo sides, other than to list the titles and a 1984 copyright. I suspect that these combo selections are of fairly recent vintage, and the absence of names leads me to think that the "friends" in the title are not exactly

household names. Still, they play well, and the late Swing Era band-leader is in top form. This will do nicely until RCA's series of Bluebird CDs brings us Goodman in the peak period.

**New York Scene: Art Blakey.** Art Blakey (drums); Terence Blanchard (trumpet); Donald Harrison (alto saxophone); Jean Toussaint (tenor saxophone); Mulgrew Miller, Dick Katz (piano); Lonnie Plaxico (bass). Concord CCD-4256.

*New York Scene* features Art Blakey's Jazz Messengers, Class of '84, recorded during a New York club engagement. Three of the young players have already achieved international recognition: trumpeter Terence Blanchard, whose "Tenderly" will linger in your memory; alto saxophonist Donald Harrison, who lately has been heard riding to the top alongside Blanchard; and pianist Mulgrew Miller. All are heard to advantage, both musically and technically, as is Blakey himself.

**Duke Ellington Meets Coleman Hawkins: Duke Ellington/Coleman Hawkins.** Duke Ellington (piano); Coleman Hawkins (tenor saxophone); Ray Nance (cornet and violin); Lawrence Brown (trombone); Johnny Hodges (alto saxophone); Harry Carney (baritone saxophone and bass clarinet); Aaron Bell (bass); Sam Woodyard (drums). MCA Impulse MCAD 5650 JVC-461.

In the early Forties, Duke Ellington and Coleman Hawkins began toying with the idea of recording together, and in 1962 the lingering idea became a reality. Individually, these two giants have made immeasurable contributions to jazz—together, they are simply wonderful. Since the supporting players are a contingent from Duke's band, the result is, of course, quite Ellingtonian in flavor, but Hawkins's robust, seething tenor adds a highly compatible voice to this familiar chorus. Hearing Hawkins and Johnny Hodges together is a feast in itself, and the sound on this CD is extraordinary.

**The Ballad of the Fallen: Charlie Haden/Carla Bley.** Charlie Haden (bass); Michael Mantler, Don Cherry (trumpet); Dewey Redman (tenor saxophone); Carla Bley (piano, glockenspiel); Paul Motian (percussion); others. ECM 923794-2.

The ECM label has long been known for its high technical quality, so it is not surprising to find its catalog eminently suited for CD release.

One of the best, so far, is *The Ballad of the Fallen*, whose ten digitally recorded selections form a loosely thematic protest against human rights violations in South and Central America. It features bassist Charlie Haden and pianist Carla Bley fronting a 12-piece band that combines such known players as Don Cherry, Paul Motian, and Dewey Redman with those who are less known, but no less impressive.

**The Symphony Of a Jazz Piano: George Wallington.** George Wallington (piano). Interface 33C38-7825.

George Wallington was Giacinto Figlia when he came to New York from Sicily, at the age of one. A few years later, his inclination to dress elegantly earned him the nickname "Lord Wallington." Judging by the cover photos on *The Symphony Of a Jazz Piano*, a set of digital solo recordings made especially for CD release, Mr. Wallington continues to dress elegantly, and his playing is no less stylish. Three decades ago, Wallington, the composer of pop classics "Godchild" and "Lemon Drop," became so disheartened by the commercial direction the music had taken that he walked off the jazz scene. Perhaps he has come back to prove that you don't have to plug in and push myriads of buttons to sound like a symphony. This is a gratifying 54 minutes of original Wallington compositions, expertly played by a man of rare integrity and sensitivity. If Wallington's name is new to you, listen to this set, then look for CD appearances of his Prestige and Blue Note recordings—you are in for a treat.

**Trio/Brass: Sonny Rollins.** Sonny Rollins (tenor sax); Nat Adderley (cornet); Harold Land (tenor sax); Dick Katz (piano); Rene Thomas (guitar); Junior Mance (piano); Henry Grimes (bass); Roy Haynes (drums); others. Verve 815-056-2.

As the title implies, this 1958 Verve set features saxophonist Sonny Rollins in two contexts: trio and brass settings. However, the most remarkable track is "Body and Soul," an unaccompanied performance that illustrates, better than any other selection I have heard, the astounding technical quality made possible by the laser system. Rollins's tenor has an uncanny presence here, despite its having been recorded almost thirty years ago, without the use of Dolby.

**Interplay: Bill Evans.** Bill Evans (piano); Freddie Hubbard (trumpet);

Jim Hall (guitar); Percy Heath (bass); Philly Joe Jones (drums). Riverside 678-9445.

There was a time when the business forces behind Bill Evans saturated the market with his trio recordings. Too much is too much, even when it comes from a talent of this late pianist's caliber. *Interplay*, a 1962 Riverside album, features Evans within the more diversified context of an all-star quintet, and there is never a dull moment. Freddie Hubbard is heard with all the vitality and inventiveness his playing lacks today, and the rhythm section—with guitarist Jim Hall, bassist Percy Heath, and the extraordinary drummer, Philly Joe Jones—is exhilarating.

**Velvet Soul: Carmen McRae.** Carmen McRae (vocals); Zoot Sims (tenor saxophone); Larry Bunker (vibes and percussion); Joe Pass or Bucky Pizzarelli (guitar); Ray Brown (bass); others. LRC Denon 33C38-7970.

For playing time, few single-disc releases can match *Velvet Soul*, a 73-minute collection of Carmen McRae sides that originally appeared—as *Ms. Jazz and It Takes a Whole Lot of Human Feeling*—on two early Seventies Groove Merchant albums. Fortunately, the musical value is also high, and Ms. McRae's commanding style—which she pours into robust "How Could I Settle For Less" and intimate "You and I" molds with equal ease—is even more engaging when experienced with CD clarity. There are strings here and there, and Zoot Sims's tenor sax adds verve to such sides as "You're Mine You," "Masquerade," and Stevie Wonder's "Sunshine Of My Life." As with other Denon CD jazz releases, the recording data (time, personnel, etc.) is to be taken with a grain of salt. There are better McRae albums in the vaults, but you certainly won't go wrong with this one.

**The Blues . . . A Real Summit Meeting: Various Artists.** Big Mama Thornton, Eddie "Cleanhead" Vinson, Muddy Waters, Jay McShann, Clarence "Gatemouth" Brown, Lloyd Glenn, B.B. King, Arthur "Big Boy" Crudup (vocals and instrumentals). Mobile Fidelity Sound Lab MFCD 2-813-1/2, two discs.

Big Mama Thornton belting out her two of her hits, "Little Red Rooster" and "Ball and Chain"; violinist Claude Williams and Jay McShann breezing through Arnett Cobb's "Smooth Sailing"; pianist Lloyd Glenn's mellow "After Hours"; and faithful renderings of classic solo numbers by Meade Lux

Lewis and Pinetop Smith. These are but a few of the highlights from a two-disc set captured at Lincoln Center's Philharmonic Hall during the 1973 Newport In New York festival. Add to that peak performances by Eddie "Cleanhead" Vinson and Clarence "Gatemouth" Brown, and you have a superb set of America's most enduring musical genre—blues.

**Film Soundtracks: Miles Davis/Art Blakey.** The Davis group: Miles Davis (trumpet); Barney Wilen (tenor saxophone); Kenny Clarke (drums); others. The Blakey group: Art Blakey (drums); Lee Morgan (trumpet); Benny Golson (tenor saxophone); Bobby Timmons or Duke Jordan (piano); others. Philips 822 566-2.

It runs two and a half minutes over an hour, and there is not a single regrettable second on this superb CD release of French soundtrack music by two of the greatest leaders American modern jazz has fostered. The Miles Davis tracks were improvised one night, while the group viewed pertinent footage from *Elevator To the Scaffold*, a so-so 1956 Louis Malle melodrama. This unorthodox method of "writing" a film score produced spectacular results, but this superbly transferred CD offers even more: nine equally impressive 1959 soundtrack recordings by Art Blakey's Jazz Messengers (some with Lee Morgan, Benny Golson and Bobby Timmons), made for two less-memorable French films. This is a must acquisition for anyone who values mainstream modern jazz.

**The Silver Collection: Harry James.** Harry James (trumpet); and His Orchestra. Verve 823-229-2.

The 1959-1960 Harry James orchestra was not a star-studded one, but it was well-oiled and often comfortably Basie-ish. Here, from the MGM catalog, is over an hour of well-recorded fine, bubbly big band jazz in the Swing tradition. A couple of previously unissued sides, "She's Gotta Go" and "Mae & Roe" have been added to a program of standards from the repertoires of Ellington, Basie, Barnet, and Miller. To be sure, the band lacks an identity of its own, but soloist James's style is unmistakably his.

**An Evening with George Shearing and Mel Torme: George Shearing/Mel Torme.** Mel Torme (vocals); George Shearing (piano); Brian Toriff (bass). Concord Jazz CCD-4190.

In 1982, on a night when many of us did some last-minute filing to keep

the IRS happy, a group of people assembled in the Peacock Court of San Francisco's Mark Hopkins Hotel to hear Mel Torme and George Shearing make great songs even greater. With considerable help from bassist Brian Toriff, the two seasoned purveyors of good taste deliver a superb set.

**Goin' Home: Art Pepper.** Art Pepper (alto saxophone and clarinet); George Cables (piano). Galaxy 670-5143.

In 1976, West Coast saxophonist Art Pepper found a musical alter ego in pianist George Cables. From the time they met until Pepper died in 1982, the rapport that developed between the two players was frequently captured on tape, but *Goin' Home* is their first and only duo session. While Pepper's death, a month after this album was recorded, produced a rash of unfortunate cashing-in releases, this is not one of them. Here, an added attraction is Pepper's use of the clarinet, an instrument he had all but abandoned.

**The Songbooks: Ella Fitzgerald.** Ella Fitzgerald (vocals); with orchestras conducted by Nelson Riddle, Billy May, Buddy Bregman, and Paul Weston. Verve 823-445-2.

This Verve Silver Collection release is an effortless hour and three minutes of Ella Fitzgerald cuddling—in her own inimitable, smooth way—familiar material by Rodgers and Hart, Berlin, Kern, Arlen, Mercer, and Gershwin. These nineteen selections were produced between 1956 and 1964, and originally appeared in LP form on various songbook albums, but Compact Disc suits them rather well.

**Night Passage: Weather Report.** Wayne Shorter (saxophones); Joe Zawinul (keyboards); and Weather Report. CBS CDCBS 84597.

Weather Report was one of the first and it continues to be one of the most successful fusion groups around. Its strength lies in the talents of its two leaders, pianist Joe Zawinul and saxophonist Wayne Shorter, who distinguished themselves in the acoustic jazz world before reaching out for young, electronics-oriented fans. *Night Passage* is a particularly interesting Weather Report release, because it also contains Duke Ellington's "Rockin' in Rhythm," updated flashback. Later, bassist Jaco Pastorius's ego got in the way of the music, but Weather Report remains a milestone group of the fusion genre.

discs, you may be able to come up with your own definition of new age. Perhaps it is easier to say what new age music does, rather than what it is: it soothes, calms, and relaxes; it creates a space for peaceful contemplation; it flows in gentle streams of consciousness. Whether expressed by the solo piano of George Winston or the electric guitar of Robert Fripp with the looped synthesizer of Brian Eno, new age music should not distract you from concentrated meditations on musical definitions.

**Dream Sequence: Tangerine Dream** (Virgin, two discs, 132:50).

Covering every major phase of their illustrious career, Dream Sequence is a double-disc set of T. Dream's finest work from 1974 to 1983. Such care and attention to digital remastering has rarely been equaled. From "Phaedra" to "The Dream Is Always The Same," synthesizers, drums, and electric guitars have never sounded so alive as here on this thankfully nonchronological opus. Disc two of this set just might be the finest single Compact Disc in existence.

**Standing Stones: A New Age Compilation** (Coda).

*Standing Stones* includes tracks from the seven new age albums released in 1986 as part of the Landscape Series distributed by Jem Records. Featured artists include Rick Wakeman (solo piano); John Themis (semi-acoustic/electric guitar); Dashiell Rae (solo piano); Tom Newman (ensemble); Stephen Caudel

(guitars/synthesizers); Clair Hamill (solo voice); and Tim Cross (ensemble). Most of this material is terrifically recorded and performed, so here's your chance to decide which of these artists you might want to purchase an entire disc of—I think they're all great.

**Thursday Afternoon: Brian Eno** (Editions EG, 60:58).

As usual with Eno, this is a wonderful (CD-only) recording but you're going to have to do a little work to enjoy it. Eno's ambitious *Thursday Afternoon* is an hour-long opus tied together by only the thinnest of melodic threads, and will require numerous listenings to dig out the juicy bits and then put them back into the context of the whole piece. Give this one a chance. You'll end up loving it.

**Impressions: Gabriel Lee** (Narada, 41:00).

The Narada label features some of the best new acoustic music available, and Gabriel Lee could be considered the classical guitar equivalent of George Winston. *Impressions* was digitally recorded and also sports the synthesizer work of Don Slepian (now with his own release on the Audion label). Although it's a touch ambient at times, the beauty of this disc will quickly win you over. If you're a player, look for Lee's upcoming book on contemporary guitar playing.

**December: George Winston** (Windham Hill, 39:27).

Considered by many to be the premier new age label, Windham Hill releases are almost guaranteed to be worth their cost. New age pianist George Winston plays with a strong emphasis on tone, color, sensation, and emotion, and *December* is great for soothing anxiety or even anger. It is lovely. A fantasy of mine would be a double-disc duet with the lean and elegant Winston and the brash and quirky Keith Jarrett—piano heaven.

**Tabula Rasa: Arvo Part** (ECM: 55:40).

Prior to 1980, Arvo Part lived in Russia and was well known for his film scores and commissioned works. Now living in Berlin, Part is producing works like *Tabula Rasa* that reflect his spiritual inspiration and interest in meditation. Also featured on this disc are Keith Jarrett, Gidon Kremer, and members of the Berlin Philharmonic and Stuttgart Orchestra. Sensitive, exciting, and fully realized compositions.

**The Desert Music: Steve Reich** (Nonesuch).

*The Desert Music*, performed by Reich and the chorus and members of the Brooklyn Philharmonic conducted by Michael Tilson Thomas, gets its title from a collection of poems by William Carlos Williams, three of which provide the text sung by the chorus. The music is orchestrated minimalism at its best, the performance is superb, and the recording is brilliant. Reich is a new age pioneer and his work should be carefully explored.

**Dig It: Klaus Schulze** (Brain, 48:51).

Klaus Schulze's illustrious past has included stints in the original lineup of Tangerine Dream, and work with top-flight German bands such as Ash Ra Tempel, Panther, and the Cosmic Jokers. He has also worked with Stomu Yamashta and Go. Schulze began producing solo albums in 1972, and *Dig It* is a 1980 release. As most of his shorter works are, *Dig It* is much more accessible than Schulze's magnum opuses *Cyborg* and *Audentity*. *Dig It* is very closely related to Tangerine Dream, with Schulze's personal edginess ever-apparent. Great remastering job.

**Into The Rainbow: Max Lasser's Ark** (Relativity, 44:28).

Lasser began his musical career in 1972 in Switzerland, playing folk, folk/rock, and jazz-influenced music. In 1984 he joined forces with harp-king Andreas Vollenweider for both



Klaus Schulze's personal edginess is ever-apparent in *Dig It*.

the White Winds tour and album (he is on Vollenweider's latest release as well). The Ark (Walter Keiser, Joel Reiff, and Pedro Haldemann) make up the rest of Lasser's (and Vollenweider's) band. So, does this excellent recording sound like Vollenweider? No, thank God, it sounds like Pat Metheny on a good day, and just beat out Metheny's *As Falls Wichita So Falls Wichita Falls* for this space.

**Mishima: Philip Glass (Nonesuch).**

I'm not usually big on soundtracks, but Glass's *Mishima*, as performed by the Kronos Quartet (a leading exponent of twentieth century chamber music), may just be one of the best CDs ever made—period. Bar none. Practically every emotion known to man is evoked by the music of *Mishima*, which fortunately does not sound like a typical Glassian outing. The combination of a powerful performance and the flawless digital recording found on *Mishima* will make any system sound good, and anybody happy.

**Silk Road: Kitaro (Gramavision, 42:40).**

Kitaro is probably the best of the canned, churn-'em-out, new age synthesists out there, and *Silk Road*, his soundtrack to a 1980 Japanese TV show (since expanded to three parts/discs), is quite well done. Moody, flashy, introspective, and sometimes overdubbed to the point of confusion, *Silk Road* combines every synthesizer available with guitars, drums, percussion, and a healthy smattering of traditional Japanese instruments—or at least synthesizer programs designed to sound like all of the above.

**Mythos: Barry Cleveland (Audion, 40:55)**

Audion is a new label headed up by electronic music wizard Larry Fast, and its marvelous discs are exclusively devoted to state-of-the-art electronic instrumental music—"The First Wave of the Next Age." Cleveland plays electronic guitar, expanding the vocabulary of the instrument with clocked multiple digital delays, tape loops, violin bows, the Thumbbo, the Masley Bowhammer; and the E-Bow. The compositions range from solo guitar to full arrangements. Also features the talents of Bob Stohl and Kat Epple (Emerald Web), and Mike Masley.

**On The Future of Aviation: Jerry Goodman (Private Music, 42:20).**

Another terrific new age label, Pri-

vate Music is lucky to be releasing Goodman's debut solo recording. From the Flock to Mahavishnu Orchestra to this solo, Goodman's violin and guitar playing is astounding and worth your undivided attention. Don't miss his violi playing (you'll hear it)—an instrument of his own invention, and see if you can pick up on Sanford Ponder's tweaky Fairlight programs. It's all so ethereal and accessible at the same time.

**Nirvana Rod: Deuter (Kuckuck, 4845).**

The Celestial Harmonies label has a lot to be proud of (Paul Horn, Hans Otte, James Newton) and Chaitanya Hari Deuter is no exception. This absolutely beautiful disc contains music composed, produced, and performed entirely by Deuter, with renu, harp and sebastiano, and tablas. Enchanting and meditative, this disc might help you attain the Nirvana its title suggests. The post-production digital reprocessing by Stephen Hill is excellent—check it out with headphones.

**Flammende Herzen: Michael Rother (Sky, 34:88).**

Michael Rother is a German multi-instrumentalist of Cluster fame, and is joined by Jaki Liebezeit of Can on this disc of his debut recording from 1976. This disc, as will any other prepared from a Conny Plank production, sounds great despite its age. Rother's compositions range from soft, melodic little keyboard ditties, to bold electronic statements spurred on by the marshal drumming of Liebezeit. Because Sky recordings are so hard to find, I'm assuming Rother's second record, *Sterntaler*, a more realized performance, is also available. If you see it, grab it! Then call me and tell me where you got it.

**Wolkenriese: Eroc (Brain, 39:32).**

Eroc, or Joachim Ehrig, is another German multi-instrumentalist, best known for his work with the band Grobschnitt. Wolkenriese is a compilation of his three solo efforts, and features the nucleus of Grobschnitt, including Gerd Kuhn, Stefan Danielak, and Volker Kahrs. While Grobschnitt is a not-to-be-missed mixture of Yes, E L & P, Rush, Saga, and Firesign Theater, Eroc's solos are moody, sparse, introspective, and outstanding synth/guitar works that capture your attention. Great introduction to the gold-mine Brain label.

**The Essential Jean-Michel Jarre: Jean-Michel Jarre (Polydor/Disques Dreyfus, 51:44).**

Jarre recently made history with

his Rendez-Vous concert, projected onto the Houston, Texas skyline. Spanning the decade of 1976 to 1986, this disc contains excerpts from Jarre's best work, including *Oxygene*, *Equinoxe*, *Les Chants Magnetiques*, and *Zoolook*. At times the music on this disc is nothing more than aural wallpaper, yet for the most part it is highly emotional and gripping. *The Essential Jean-Michel Jarre* is a must for any new age/electronic collection.

**Autobahn: Kraftwerk (Vertigo).**

When Kraftwerk (it means power-plant) hit America's shore with *Autobahn* back in 1974, the music world was stunned, incapable of defining it, and unable to turn it off. Combining elements of electronic music's founding fathers such as Pink Floyd, Terry Riley, Steve Reich, Tangerine Dream, and a host of others, Kraftwerk unwittingly commercialized electronic music and opened the door for much of what is today called New Music. The tunes of *Autobahn* are catchy, repetitive, well-produced, and innocuous all at the same time. Mindless fun at its best.

**Old Land: Cluster and Eno (Sky, 41:03).**

I don't have to tell you who Brian Eno is, but Cluster is Hans Joachim Roedelius (Guru Guru, Harmonia), Dieter Moebius (Guru Guru, Harmonia, Moebius and Plank), Holger Czuckay (Can), and Conny Plank (all of the above/producer). This incestuous group of men have been making music in numerous incarnations since the late Sixties, and not once has the product been boring. This disc with Eno seems to be culled from two earlier releases called *Cluster & Eno* and *After The Heat*. Both minimalist and orchestrated, these two gentlemen never fail to musically entertain and please.

**Dark Side Of The Moon: Pink Floyd (Harvest, 42:58).**

There's little more that can be said about this classic recording. Not only did it signify the beginning of a new age in music, but it still stands up as a premier new age recording. Some things do change, however. This material sounds even better on disc—providing you get the UK pressings and not their American counterparts. The stereo effects that were always lost on vinyl appear with the same amazing lack of subtlety as originally intended. This disc is manna from heaven, especially without the clicks and pops of vinyl.

**The Planets:** Tomita (RCA Red Seal, 52:07).

Have you ever been in a hi-fi shop and not heard Isao Tomita's rollicking electronic version of Gustav Holst's *The Planets*? This is electronic chintz, glitz, champagne, and bubbles—Tomita is the Lawrence Welk of the synthesizer and you either love him or leave him. Either way, his unique rendition of *The Planets* is marvelously bombastic, extremely well recorded and produced, and difficult not to enjoy—even for its humor value.

**Electronic Realizations For Rock Orchestra:** Synergy (Passport, 46:53).

Synergy is Larry Fast, synthesizer builder, player, composer extraordinaire, and this is his 1975 musical debut now fully realized on Compact Disc. Considering the limited ability of the synthesizer in 1975, this is an absolute masterpiece, though Larry has developed well along with the instrument. The sound quality is excellent, and the disc has been remastered in (gulp!) quad. Outstanding tracks are "Slaughter On Tenth Ave-

nue" and "Warriors." Be sure to look for Larry's upcoming release on the Audion label; after hearing this, how can it be bad?

**Ancient Dreams:** Patrick O'Hearn (Private Music: 32:41).

Patrick has appeared on four Frank Zappa albums, including the grand *Shut Up And Play Yer Guitar*, and is currently a member of the Missing Persons. *Ancient Dreams*, however, bears no resemblance to either band. Instead, it is both thundering and majestic, soothing and elegant, created through haunting combinations of synthesized sounds and exotic percussion effects. The spotless production was overseen by ex-Tangerine Dream member/producer Peter Baumann, who is also president of Private Music.

**Force Majeure:** Tangerine Dream (Virgin, 40:28).

There is a reason that Tangerine Dream is the only band to appear twice on this list—they are the best electronic musicians I know. Plain and simple. *Force Majeure* features

Edgar Froese and Chris Franke, as usual, but also has Klaus Krieger on drums and Eduard Meyer, the album's engineer, on cello. The big difference of *Force Majeure* is that it emphasizes the guitar instead of keyboards, and many have dubbed it the *Tangerine Dream* rock album. This is my personal favorite from the band's 20-plus discography, and it is simply unbeatable late at night during a thunderstorm with the lights down and the volume way up.

**Bayou Moon:** Tom Newman: (Coda)

Tom Newman is the genius responsible for producing Michael Oldfield's *Tubular Bells*, albums by Cat Stevens, Leo Sayer, John Cale, and many others. All told, he has played in everything from skiffle bands to a Sixties psychedelic band called July. On this Coda release, however, he bends all the new age rules with both his instrumentations and structure to give us a quirky (yet melodic) roller-coaster ride that's both technically excellent and aurally pleasing. My only complaint about this recording is that it's too short. □

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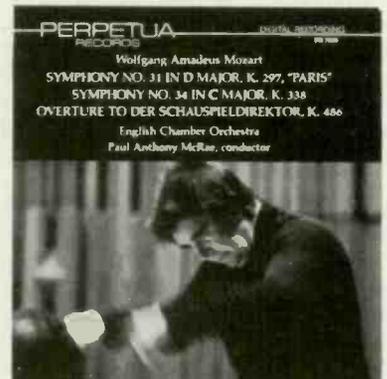
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# COUNTRY COMPACT DISCS

*The pure sound of CDs can take you down the Hillbilly Highway to country heaven.*

Now that everybody realizes the advantages of Compact Discs—the sound quality is superior in every way to the LP, you can play them repeatedly without suffering the surface noise indigenous to records, and they take far less space to store—the relatively higher price no longer seems a legitimate gripe, even to those music collectors like myself who continue to buy albums and collect CDs mainly to duplicate their favorite LPs.

Two factors continue to frustrate the serious CD collector, however. For some reason, CDs appear on the market far later—usually several months—than their corresponding LPs and, even more worrisome, the number of titles is severely limited, especially in country music. At times, the decision of which titles should be released on CD appears to follow no rhyme or reason. Such classic albums as Willie Nelson's *Red Headed Stranger* (Columbia), Emmylou Harris's *Roses in the Snow* (Warner Bros.) and Elvis Presley's *The Sun Session* (RCA), for example, have never been released on CD. Nor are any of Hank Williams's or Bill Monroe's seminal recordings available on Compact Disc. How gross an injustice that is becomes apparent with the knowledge that Louise Mandrell, a singer whose inimitable talent is better suited to making shampoo and sausage commercials, has not one, but two CDs available (both on RCA).

(And while I'm griping, why do the little plastic boxes have to be so hard



by Alanna Nash

to get into, especially since I'm almost always holding a naked disc with one hand and trying to spring the box with the other?)

Those problems aside, it is still possible to build a good, basic library of country CDs, although if your community is anything like mine—and I live in a city of just under one million people—you will have to shop in a variety of stores to find what you need, since most record outlets still do not stock anything near a full line of country CDs.

In compiling such a collection, I have tried to select discs that have superb compositions and extraordinary performances, as well as the heightened sound quality normally associated with the technology. In some cases, however, as noted, I have included a disc that may be

lacking in one, or even two, of the considerations, but which rounds out the list.

Here is my basic country CD collection, in alphabetical order:

**Greatest Hits: Alabama** (RCA).

This is one of those discs I would not necessarily buy myself, but as the success story of the '80s Alabama is more than representative of the country-pop synthesis that passes today for mainstream country music. Often referred to as the Monkees of country music, both because the group rarely plays on its own records and because of the lightweight subjects of most of

their songs, Alabama nevertheless boasts a soulful lead singer in Randy Owen, the only thing that makes many of their tunes palatable. This greatest hits package features live versions of two of the band's signature tunes, "My Home's in Alabama" and "Tennessee River," and both renditions are vast improvements over the original amateurish recordings. The real highlight, however, is "She and I," a Dave Loggins song that bounces along with insouciant eroticism. All in all, though, this is enough Alabama to last a lifetime.

**Rhythm and Romance: Rosanne Cash** (Columbia).

After generations of sweet, submissive, gingham-clad "girl singers," Rosanne Cash crashed into country music in 1980 like a roller-derby

*New Pond, by Grant Wood, Courtesy of the National Gallery of Art.*

queen at a square dance. With her New Wave clothes and spiky punk hair, she seemed more California than country, even if her daddy did happen to be The Man in Black. A total hybrid artist who fits no existing female country mold, Cash espouses a hard-edged romanticism in a rock-oriented and progressive musical framework. Despite such strong performances as *Right or Wrong* and *Seven Year Ache*, both also available on Columbia CDs, Cash's music was never better expressed than on 1985's *Rhythm and Romance*, an album that challenges the boundaries of modern country music in form, content, and even language. This beautifully recorded album, which especially shows off the CD capabilities (listen to the sound of the pick on the acoustic guitar strings on "Second to No One") chronicles the stabilizing of Cash's marriage, her treatment for cocaine addiction, and her maturing relationship with her father. A tour de force of verve, intelligence, performance and recording values.

**Treadin' Water: Earl Thomas Conley (RCA).**

Earl Thomas Conley, who wears a sad face remarkably like that of Jesus, is one of country music's real treasures. He is an artist who works from tradition, but applies all the old rules to a modern and energetic production style. Conley is a thinking man's songwriter with an eye for the essence of things. This particular album is a perfect modern country record, full of vision, vitality and punchy rhythms that often settle down more on the rock than the country side of things. At the same time, however, it sacrifices none of country's requisite misery and guilt, Conley's songs forming an affecting fusion of pleading and prayer. Conley's career has never made him a household word, and *Treadin' Water* never quite got the recognition it deserved. Nevertheless, it remains one of the best country LPs of the decade, augmented by a lovely CD recording.

**Greatest Hits: Earl Thomas Conley (RCA).**

In 1984, Conley became the first artist in musical history to produce four number one hits from a single album. In other words, it didn't take him long to fill up a greatest hits album, and this one is generous. One of the two new songs added as "sweetening," or buyer incentive, "Once in a Blue Moon," turned out to be one of the most evocative of

Conley's ballads, and proved him to be a singer of far greater depth and sensitivity than most of his previous records hinted. On the CD version of this song, especially at :45 into the performance, Conley's voice sounds like a well-rosined bow drawing across a cello string.

**Guitar Town: Steve Earle (MCA).**

Texas native Steve Earle calls his style "80s hillbilly music," but that's too much shorthand for the stunning synthesis of rough-edged country-rock and rockability Earle rolls out for his debut LP. A songwriter of uncommon strength, Earle draws a sharp bead on working-class America, turning up gritty portraits of small-town dreamers and day-to-day existers that register with the heart and the head. Whether you consider this country or rock, *Guitar Town*, with the classic "Hillbilly Highway," is one of the most fulfilling debut albums to come along in years. And the sound, from an original digital recording, will knock you dead.

**Cadence Classic (Their 20 Greatest Hits): Everly Brothers (Rhino).**

The Everly Brothers, who came from a solid country background—they were even members of the Grand Ole Opry at one point—took rock'n roll perilously close to country music in the late '50s, and now in the '80s everybody in Nashville is scrambling to get their harmony into their music. If you've forgotten just how good they were, or how they influenced everybody from the Beatles to Sweethearts of the Rodeo, this disc—a CD version of the famous Barnaby Records compilation—will bring it all back clear as yesterday. Recordings made in the '50s and '60s are sometimes inferior to today's technology, but while CDs as a whole make the old tracks sound more dynamic, this particular disc is especially clean. Tape hiss is almost indiscernible, but what's there was left instead of filtering out ambience or transient response. All the tracks are in their original state—true mono or stereo—and processed with a light hand on the equalization. Packaged with a deluxe booklet of rare photos and historical notes.

**Once in a Very Blue Moon: Nanci Griffith (Philo).**

Sometimes called "the Joni Mitchell of the '80s," Nanci Griffith is a literate singer/songwriter whose style rides a fine line between folk and progressive country. Her textured soprano, spiced occasionally with a

husky growl, is reminiscent of Buffy Sainte-Marie when her vibrato really gets going, and when people discover who Griffith is, she'll probably be a mammoth star. Meanwhile, in addition to the pretty (if slightly sentimental) ballads about restless love, this album offers some *very* hot picking and a number of intriguing story-songs, one about a British motorcycle daredevil who bought it in an Evel Knievel-like car-jumping stunt, and another about a middle-class black couple chasing the American dream in Houston. Somehow, Griffith manages to infuse her music with a '60s innocence while retaining a savvy, hip edge. A lovely CD from a potentially important artist.

**His Greatest and His Best: Merle Haggard (MCA).**

Most of the Hag's Epic albums are as downcast and predictable as rain these days, but back when he was still with MCA, he wrote some truly inspired hit singles, full of sass and sardonic humor. That's mainly what this CD contains—all of his MCA *Greatest Hits* LP, plus "Leonard," "Back to the Barrooms Again," and three other tracks. The sound quality is uniformly good, but the five Jimmy Bowen-produced cuts, with their close-miking and exemplary mix, are positively thrilling. At his best, Haggard is not only a master of the country song—the finest singer/songwriter of the post-Hank Williams era, some say—but one of the true enduring heroes of the genre. There's plenty here to prove it.

**The Ballad of Sally Rose: Emmylou Harris (Warner Bros.).**

In 1984, Emmylou Harris, one of the premiere female country stylists, quit the road to begin work on her first major composing project, *The Ballad of Sally Rose*. A concept album that stands as a tour de force of writing, singing, playing and even production (although I'm not as enchanted with the "soft and bright" washes of sound as I used to be), *The Ballad of Sally Rose* is based somewhat on Harris's own life, and rivals *Roses in the Snow* as her masterpiece. In the course of thirteen songs that trace the life and career of a female singer, it incorporates the elements of fate, tragedy, and success tempered by heartbreak and elusive peace of mind. Much of it is among the most moving and lyrical offerings in the history of country music, and the sound, recorded digitally (although the CD mistakenly says otherwise), is first-rate. The sequence listing is in

error, as it fails to list "Heart to Heart" as a separate song.

**Profile/Best of Emmylou Harris and Profile II/Best of Emmylou Harris: Emmylou Harris.** (Warner Bros.)

Alabama-born, but California-cured, Harris was initially perceived as less hillbilly than hippie, since she came to appreciate country music only in her twenties. Nevertheless, beginning with her debut album, *Pieces of the Sky* (1975), she has conveyed an authenticity above reproach while balancing stalwart country standards with brilliant, sometimes esoteric, contemporary country-rock. Aside from an almost innate sense of good song selection, however, Harris has a voice that, it has been said, would melt an all-day Sugar Daddy. These two "best of" CDs, sold separately, demonstrate why both the traditional Old Guard and the hip, country-rock faction accepted her into their folds. Since my original analog recordings of these songs are virtually worn out, I was amazed at the dynamic clarity of all of the instrumentals, but particularly the twin fiddles on "Making Believe." From strictly a program point of view, *Profile II* . . . is not as grabby as the first volume, but the CD rendition of "Wayfaring Stranger" on *Profile II* . . . unfolds things I never heard—like crickets chirping from beginning to end!—on the Dynaflex version. And "Mister Sandman," so charming on analog, with its "answers" scurrying across the channels, is something that simply has to be heard on CD. Also worthy of any collection is Harris's *White Shoes* (also on Warner Bros.), her co-called rock'n'roll album, with a haunting and unforgettable performance of "On the Radio."

**Greatest Hits and Greatest Hits Volume 2: Waylon Jennings** (RCA).

There is so much more to the big, booming-voiced Waylon Jennings than the way he comes across on volume one—mainly as a cardboard cutout intent on cementing his outlaw image—that I hesitate recommending it unless you also buy volume two, which rounds out his persona with such songs as "Shine" and "Don't You Think This Outlaw Bit's Done Got Out of Hand." But even without the songs that provide a peek at the rest of his sensibility, volume one is a fair primer to Jennings's '70s output. Besides, it also includes "Amanda," one of the finest moments of his career. A better choice overall, however, would be *It's Only*

*Rock & Roll*. The catch, natch, however, is that it isn't yet available on CD.

**Will the Wolf Survive: Waylon Jennings** (MCA).

After spending virtually his entire recording career at RCA, Waylon Jennings moved over to MCA last year and cut this album that eschews his usual outlaw material for introspective songs about life's peaks and valleys and well-disguised booby traps. In contrast to the first *Greatest Hits* package, where Jennings often comes across as an actor going through his full line of macho moves, Jennings emerges here as a vulnerable, three-dimensional human being. His singing is full of punch, commitment, and nuance, and the original digital production updates Jennings's instrumental approach without radically altering his style. If you thought Jennings was getting tired and repetitive, this should definitely change your mind. The wolf survives, indeed.

**Anniversary—Ten Years of Hits: George Jones** (EPIC).

No country collection would be complete without at least one disc of George Jones material, since Jones is universally recognized as the greatest country singer of all time. When you talk about pain and suffering, Jones has *been* there, and he puts every ounce into his music. Unfortunately, the people who decide what to manufacture on CD don't seem to care—there's very little available for Jones on CD.

**Why Not Me: The Judds** (RCA).

The Judds, the mother-daughter

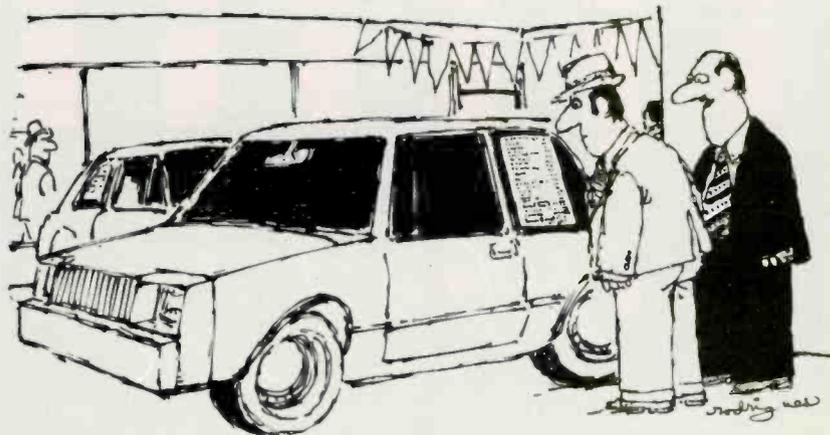
duo who gave staid, lifeless country radio a direct and well-positioned kick in the pants, work their magic around an inventive country-jazz framework and filigreed acoustic guitar, coming up with a fresh, new direction for both traditional and progressive country fare. The daughter, 22-year-old Wyonna Judd, is being heralded as the most significant new country female voice of the last 20 years. A must for any collection.

**Rockin' With the Rhythm: The Judds** (RCA).

Slightly more pop-influenced than their first two LPs, this one nevertheless contains one of the most calculated country hits of all time, "Grandpa (Tell Me 'Bout the Good Old Days)," and two other number one country songs. At this stage, The Judds can do no wrong. Unless, of course, you count their jivey version of "Working in the Coal Mine," their only foray into embarrassment. Still, a terrific album.

**Whoever's in New England: Reba McEntire** (MCA).

There aren't many women singers in country music today who can infuse a song with as much convincing heartache as McEntire, a gen-u-wine Oklahoma cowgirl who grew up ropin', ridin' and rodeoin'. With this—her fourth LP for MCA—it is certain that she has not only revived the woman-to-woman song genre that Kitty Wells established and Tammy Wynette made so famous in the late '60s—but that McEntire, the Country Music Association's Female Vocalist of the Year for two years



“ . . . This sticker is just for the car's stereo system, sir. The price sticker for the car is on the other side. . . . ”

running, has carved her place alongside Kitty and Tammy as one of the foremost woman singers in the history of country music. *Whoever...* is McEntire's finest album yet, topped off with a Jimmy Bowen production that is nothing less than sparkling.

**Lost in the Fifties Tonight: Ronnie Milsap (RCA).**

Ronnie Milsap, while a superior vocalist and musician, normally would not make any list I might draw up, mainly because he too often turns in album performances that resonate with glossy shallowness. There's a certain amount of that on this effort, a concentrated mining of 1950s nostalgia, but when Milsap gets down and croons, he's hard to beat for seamless, ingratiating pop. What really gets him in this company, however, is the technical quality of this recording. Milsap, a meticulous sound freak with his own studio, is also a crafter of impeccably produced sound.

**Stardust: Willie Nelson (Columbia).**

Of all the Willie Nelson CDs available, this is the most consistently pleasing. Nashville record execs thought Nelson was out of his gourd when he delivered this LP of Tin Pan Alley standards in 1977, but Nelson,

dusting off the old melodies, personalized them enough that the rural folks didn't know whether they were country or pop, and the world at large got its first unquenchable taste of the pride of Abbot, TX. The CD boasts surprisingly fresh sound dynamics.

**Highwayman: Willie Nelson, Waylon Jennings, Johnny Cash, Kris Kristofferson (Columbia).**

With all-star albums popping up as often as "Baby on Board" signs these days, *Highwayman* is a rare treat—four consummate country voices blending in friendship and harmony over dignified, high-quality material, stamping their marks of individuality on even the most familiar songs. Unlike so many all-male record projects which boast of endless macho deeds, this one celebrates masculinity from the viewpoint of the mature man, one who defines himself through relationships with the human family at large. Although this album came out in 1985, the title song, which explores the theme of reincarnation, still provokes shivers. Overall, an unassuming little gem of a record, with moments of almost paralyzing beauty.

**Greatest Hits: Dolly Parton (RCA).**

There are a couple of tunes here

that you would have to be a certified Dollycologist to stomach—"Me and Little Andy" is the worst offender—but there's no arguing that Parton is one of the most original and gifted talents working in any musical format. As it turns out, this package isn't as representative of Parton's country songwriting prowess as the *Dolly Parton/Collector's Series* (RCA), but, of course, that isn't yet available on CD. This is more a showcase for Parton the pop singer, and no matter how you feel about that particular shift of allegiance, this collection is at least more palatable than her other CD offerings, *Real Love* and *The Great Pretender*. By the way, the CD version of *Greatest Hits* replaces "Hard Candy Christmas" with Parton's hit duet with Kenny Rogers, "Islands in the Stream."

**Golden Record and 50,000,000 Elvis Fans Can't Be Wrong/Elvis' Gold Records Volume 2: Elvis Presley (RCA).**

Okay, I'll admit these albums aren't exactly *country*, but many of the songs—especially on the first volume—do still qualify as rockabilly. And no amount of blue suede blubber jokes can nullify Presley's influence or the fact that he was un-

# RECOMMENDED FOR THOSE



To record at high levels you need the right tape. We recommend three. Maxell's new MX and XL-S high-performance tapes deliver just what you need for today's digital music. Great

questionably one of the finest singers of all time. The CDs, sold separately, restore the performances to original mono. Check out also *Elvis Presley* (RCA), the CD version of his first album. And pray for release of *The Sun Sessions*.

**Live in London: Ricky Skaggs (Epic).**

For all his dazzling musicianship and almost single-handed resurrection of true country music, there are times when Ricky Skaggs appears embarrassingly to be the Gomer Pyle of country music. So sincere, so pure of heart, so hillbilly rube, such as in his onstage prattle on this live digital recording. But then, talking is not what Skaggs does best. Once he picks up his axe of the moment—assisted by *the band of the hour*—he moves into your head and starts rearranging the furniture. This Compact Disc contains all of the hits found on Skaggs' other albums, plus some terrific new songs: a killer version of "Don't Get Above Your Raising" with Elvis Costello, a previously unreleased cut, the chilling spiritual "Talk About Suffering" sung *a capella*, and three other songs not included on the original LP. *Live in London* is spotty in places, but at its best, it's as good as chicken fried steak.

**Greatest Hits: George Strait (MCA).**

George Strait, a certified hunk of choice USDA beefcake, has built a career out of parodying his idols—Merle Haggard, George Jones and Lefty Frizzell, to name a few. What has earned him the Country Music Association's Male Vocalist of the Year award, however, is not originality, but the fact that he does what he does so well—with performances full of grace and even nobility, especially when he turns his attention to western swing. Strait is also, incidentally, a leader of the "new traditionalism," something you wouldn't know from the pop-heavy "Marina Del Rey," included in this collection of top singles. Would George Jones have cut that song? But is Jones selling records in numbers anywhere approaching George Strait? No way.

**Greatest Hits and Greatest Hits Volume 2: Hank Williams, Jr.**

The Country Music Association still refuses to acknowledge it, but Hank Williams, Jr. is one of the most powerful singer/songwriters hillbilly music ever conjured up. A man of irresistible charm and wit, if also of redneck obsessions, Williams has tended to dump all of his growing pains into his music, resulting in al-

bums that are often undisciplined and uneven, if stocked with diverse and irreverent hit singles. These two CDs offer all the hits without the misses, and they add up to a staggering body of work. Volume one, from 1979-1981, concentrates more on Hank's fusion of country and rock, while volume two finds him less angry and urgent—but no less engaging—as he concerns himself with the various ceremonies of the heart. After a lifetime of promise, Bocephalus has turned into what his daddy would call a *hoss*.

**Guitars, Cadillacs, Etc., Etc.: Dwight Yoakam (Warner Bros.).**

In one of the most bodacious hype campaigns known to humankind, Dwight Yoakam has arrived full-blown from the head of Hank Williams to capture both the cornbread and soup bean crowd *and* the zombie slaves of MTV. Essentially a revivalist of the traditional honky-tonk style, Yoakam is a snake-hipped mumbler with a crackerjack band, a knowing attitude, and a stance that makes him seem as if he's auditioning for the movies. But he is also one of the bright lights on a mostlysluggish scene, writing sweet songs of hard-scrabble purity and worth. □



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Special Test Report

# SONY CDX-A10

by Julian Hirsch and  
Christopher Greenleaf

SONY'S revolutionary CDX-A10 "DiscJockey" is more than just a car Compact Disc player, more even than a car CD *charger*, novel as that is. It is even more than just an unusually impressive engineering tour de force of miniaturization. What it represents is the first step toward moving car stereo electronics out of the dashboard and into the trunk or another protected area—safe from covetous eyes and meddling fingers.

The DiscJockey consists of two basic modules and an optional third. The main unit, designed for trunk mounting, is a combination CD player/changer and preamplifier inside a protective case measuring about 12¾ x 5¼ x 8¼ inches. Its weight is about 12½ pounds. A long umbilical cable connects the trunk unit to a remote control/display unit, called the Commander, that measures 7 x 1 x 2 inches. The cable's length allows the Commander to be placed virtually anywhere in the car within reach of the operator—who doesn't have to be the driver.

The Commander's dimensions allow it to fit into a

VITTORIO SARTOR







## HITACHI DA-501 COMPACT DISC PLAYER

*Julian Hirsch, Hirsch-Houck Laboratories*

**D**ESPITE the disarmingly simple appearance and modest dimensions of Hitachi's DA-501 Compact Disc player, it has a full complement of operating features. Track-search buttons skip back to the beginning of the current track or forward to the next one, and repeating these operations enables a user to access any track in a very short time. The track controls are supplemented by fast-scan buttons that move the laser pickup at high speed in either direction, with the program audible at reduced volume. The fast-scan buttons can also be used to access indexed portions of individual tracks.

The DA-501 can be programmed to play up to fifteen tracks in any sequence. Like most other CD players, it also has a REPEAT button, which can be used to repeat the entire disc or a programmed track sequence. In addition, the DA-501's repeat button can be used to program any segment or phrase for repetition.

When a disc is first loaded, the display window shows the total number of tracks. The SHIFT button

toggles the display between the track total and the total playing time of the disc. During play, the display shows the current track and index number (the latter reads 01 if the record is not indexed), and the SHIFT button switches it to show the elapsed time, in minutes and seconds, of the current track.

The DA-501 is furnished with a wireless remote control that duplicates all the front-panel controls except the power switch and the headphone-volume adjustment. In addition, the remote has a keypad, numbered from 0 to 9, that provides direct access to any numbered track up to 99.

The Hitachi DA-501 weighs 9½ pounds and measures 17½ inches wide, 10¾ inches deep, and 3¼ inches high. The case and panel are finished in black with clearly legible white and silver markings. Price: \$599. Hitachi Sales Corp. of America, Dept. SR, 401 W. Artesia Blvd., Compton, CA 90220.

### Lab Tests

With the audio outputs terminated in 10,000 ohms and 1,000 picofarads, the output level of the

Hitachi DA-501 from the 1,000-Hz, 0-dB level tones on our test discs was 2.17 volts (identical for both channels). The frequency response was flat from 20 to about 1,500 Hz, falling off very slightly from there to 10,000 Hz before rising to nearly its original level from 16,000 to 18,000 Hz. The high-frequency responses of the two channels differed very slightly (a maximum of about 0.3 dB), but the worst-case overall re-

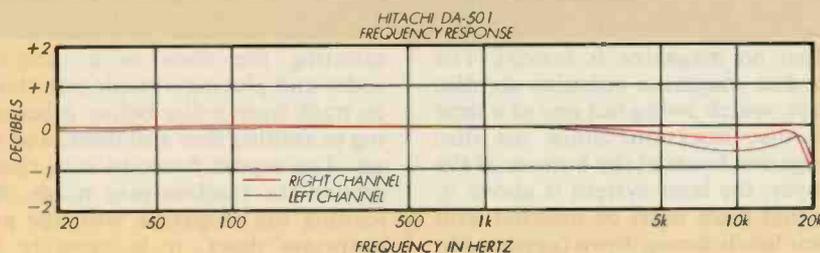
*The laser tracking mechanism of the Hitachi DA-501 responded very rapidly to the track-skip and scan controls. Only 1.5 seconds were required to move from Track 1 to Track 15 of the test disc.*

sponse from 20 to 20,000 Hz was +0, -0.9 dB referred to the 1,000-Hz level.

The pattern of overshoot and ripple on a square-wave test signal indicated that the DA-501 used audio log low-pass filtering in between outputs. The phase shift 4 degrees channels rose from 90 degrees at 20,000 Hz to 90 degrees at 1,000 Hz, which is characteristic of the 11-microsecond interchannel time dif-

## FEATURES

- Front-loading player with motor-driven disc drawer
- Track selection by successive operations of skip buttons
- Programmed play of up to fifteen tracks in any sequence
- High-speed manual scan with program audible; during play, scan buttons provide access to indexed passages
- Repeat button can replay entire disc, programmed sequence of tracks, or user-defined passage
- Fluorescent display shows track and index number or elapsed playing time of current track
- During operation, symbols in display window show status of pause/play switch
- Front-panel headphone jack with volume-control knob
- Wireless remote control provides direct track access through numbered keypad and duplicates all front-panel control functions except power and headphone volume



## LABORATORY MEASUREMENTS

**Maximum output level:** 2.17 volts  
**Total harmonic distortion at 1,000 Hz:** 0.0032% referred to 0 dB; 0.0075% referred to -20 dB  
**Signal-to-noise ratio (A-weighted):** 96 dB  
**Channel separation:** 88.5 dB at 1,000 Hz; 61 dB at 20,000 Hz  
**Frequency response:** +0, -0.9 dB from 20 to 20,000 Hz

**Cueing time:** 1.5 seconds  
**Cueing accuracy:** A  
**Impact resistance:** sides, C; top, D  
**Defect tracking:** information layer, tracks 900-micrometer defects; surface layer, tracks 600-micrometer black dots; simulated fingerprint, pass

ference that results from multiplexing (switching) a single digital-to-analog (D/A) converter between the channels.

The DA-501 had almost unmeasurable noise and distortion levels, as is typical of normally functioning Compact Disc players. Stereo channel separation was 95 dB at 100 Hz, falling to 72.5 dB at 10,000 Hz and 61 dB at 20,000 Hz. The largest (900-micrometer) calibrated information-layer defects on the Philips TS4A test CD were played without difficulty, but the largest black surface-layer dots (800 micrometers) caused the player to stutter and hang up. The next-largest dots (600 micrometers) and the simulated fingerprint were played without audible difficulty.

The laser tracking mechanism of the Hitachi DA-501 responded very

rapidly to the track-skip and scan controls. Only 1.5 seconds were required to move from Track 1 to Track 15 of the Philips TS4 disc (most players take 4 to 5 seconds). The difficult transition from Track 17 to Track 18, which have no silent interval between them, was executed perfectly, with no clipping of the first syllable of the vocal on Track 18.

The DA-501 proved to be quite sensitive to physical impact. When we tapped the top of the cabinet while a disc was playing, the laser almost always skipped to another part of the disc or play ceased. It was less sensitive to side impact, and a second product sample proved to be slightly less touchy altogether. We were able to give the unit a passing grade in this respect, however, because it functioned per-

fectly in normal use when it was not subject to such impact.

## Comments

In respect to ease of operation, flexibility, and sound quality, the Hitachi DA-501 leaves little to be desired. The design makes effective use of multifunction controls and displays. Especially handy is the assignment of phrase-repeat operation to the REPEAT button instead of the

*In respect to ease of operation, flexibility, and sound quality, the Hitachi DA-501 leaves little to be desired. The design makes effective use of multifunction controls and displays.*

more common practice of using two separate buttons to define the beginning and end of a phrase. The pick-up's slewing speed is exceptional, surpassed by only one other CD player we have tested. The volume with 200-ohm headphones was fairly high, but regular headphone listeners will probably prefer to use more sensitive or lower-impedance phones with the DA-501.

The calibrated disc defects of the Philips TS4A challenged many early CD players, but most current models are relatively immune to such error-tracking problems. Even so, the inability of the DA-501 to correct for the maximum-size defect on one portion of this test disc should not be given undue weight; its error correction is still far superior to that of almost all first-generation CD players.

In our view, this player's weakest point is its sensitivity to tapping by the fingertips. This should not present a problem in most normal installations, however, and any mis-tracking that results from bumping or brushing against the player will not, of course, damage either the player or the disc. In all other respects the DA-501 is a very satisfactory and easy-to-use Compact Disc player.

**Circle 5 on reader service card**



## PIONEER PD-M6 MULTI-DISC CD PLAYER

*Julian Hirsch,  
Hirsch-Houck Laboratories*

**M**OST of the Compact Disc players we have tested have been very much alike in their electrical performance—and so far beyond most analog record players or cassette tape decks that comparisons are difficult to make. For the most part, the *real* differences between CD players are in their operating features, including their programming facilities, remote-control capability, physical size, and specialized applications such as use in a car or as a battery-run portable.

The Pioneer PD-M6 is certainly unique in terms of operating features, since it is the first "CD changer" designed for home use. It can be loaded with as many as six CD's, which can be played in any order—and individual tracks on them can also be played in any order. The PD-M6 even has a random-play feature that will automatically select a random program from the six discs.

The PD-M6 comes with a six-disc magazine, as well as a single-disc tray, that fits into a 1 x 5-inch loading slot on the front panel, rather as a video cassette fits into a VCR (the slot is covered by a hinged door

when no magazine is inside). The six-disc magazine contains six disc trays, which swing out one at a time for disc insertion. Since the disc magazine loads at the bottom of the player, the laser system is above it, so that discs must be inserted with their labels facing down (opposite to the usual orientation).

Most of the front-panel controls (light-pressure pushbuttons) have conventional functions, including fast manual search with the program audible, track skipping in both directions, and the usual play, pause, stop, and eject.

The programming system of the PD-M6 is highly versatile, although it lacks the index and phrase programming capability of some other players. A row of buttons numbered 1 through 6 selects the disc to be played or entered into memory for programmed play. If no disc is selected, the six discs are played in numerical sequence starting with the first. After the disc number has been entered, the track number (from 1 to 99) is selected using a row of ten buttons numbered 0 through 9 below the disc buttons. If no track is selected, the disc is played from its beginning.

The two-step operation—disc selection, then track selection—can be used for direct access to any part of any disc. The machine can also be programmed to play up to thirty-two selections in any order by using the PGM MEMORY button. Pressing the repeat button causes the entire programmed sequence to be repeated indefinitely.

If the RANDOM PLAY button is pressed, the PD-M6 automatically enters a random playback sequence,

selecting the discs in a random order and playing a randomly chosen track from a disc before proceeding to another disc and track, and so on. The repeat function also operates in the random-play mode. By loading the magazine with the appropriate discs, it is possible to assemble over six hours of music that will play in a different order each time it is repeated.

The display panel of the Pioneer PD-M6 is unusual because of the different types of information it presents. The numerical readout normally shows the current track number and its elapsed time in minutes and seconds. The display can be changed to show the total disc playing time and number of tracks or the current disc and track number. The numerical disc-number readout is somewhat redundant, however, since the lower portion of the display contains six disc symbols that resemble Pac-man figures. A red bar appears in the "mouth" of the currently playing disc. The display can also be used to check the programmed sequence of discs and tracks by successive operations of the PROGRAM CHECK button.

The Pioneer PD-M6 comes with a wireless remote-control unit that duplicates all its programming and control functions except power and eject. The player has a front-panel headphone jack with its own volume control (the line outputs are at a fixed level). The single-disc tray permits the machine to be used exactly like conventional CD players. Of course, the six-disc magazine can also be used with a single disc if desired. Additional magazines can be purchased, enabling a

# TEST REPORTS

user to prepare a variety of multi-disc programs.

The PD-M6 measures about 16½ inches wide, 12¼ inches deep, and 3¾ inches high, and it weighs about 14 pounds. It is finished in black with gold markings. Price: \$499.95. Additional six-disc magazines are \$9.95 each. Pioneer Electronics (USA), Inc., Dept. SR, P.O. Box 1720, Long Beach, CA 90801.

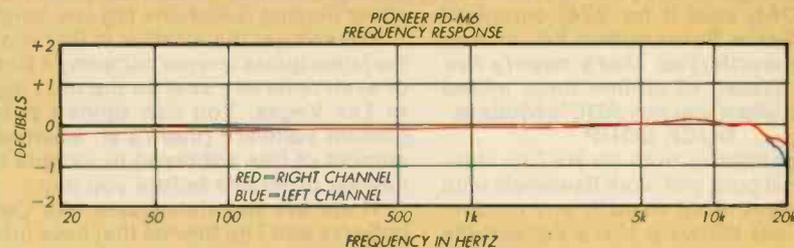
## Lab Tests

The six-disc magazine simplified our testing of the PD-M6, since we could load all of our customary test discs into it and access any track as required. The output voltage was 2.07 volts from a 0-dB recorded tone, or 1.85 volts with the standard EIA load of 10,000 ohms in parallel with 1,000 picofarads of capacitance. The two channels' output levels were nearly identical. The frequency response was +0.1, -0.2 dB from 20 to 15,500 Hz and down 0.5 to 0.9 dB at 20,000 Hz (there was a slight difference between the left- and right-channel output at the lowest and highest frequencies). The square-wave response of the PD-M6 indicated that it uses analog low-pass filtering in its outputs. The interchannel phase shift ranged from 5 degrees at low and middle frequencies to 77 degrees at 20,000 Hz, suggesting that it uses a single digital-to-analog converter multiplexed between the channels.

Other aspects of the player's performance were much like those of most CD players we have tested. The noise level, distortion, and crosstalk were all very low (at 100 Hz the crosstalk was too low to measure, better than 110 dB below the 0-dB output level). The PD-M6 operated perfectly in its various programmable modes as well as when playing single discs in normal sequence. The servo action of the laser optical system was slightly faster than in many other players, taking 3.5 seconds to slew from Track 1 to Track 15 of the Philips TS4 disc (4 to 5 seconds is typical). The transition between Tracks 17 and 18 of that disc, which have no silent interval between them, was flawless. As often happens with recent CD players, the maximum defect levels of the Philips TS4A test disc were tracked (and corrected for

## FEATURES

- Loading magazine holds up to six CD's for continuous playback; single-disc tray also supplied for conventional operation
- Random-access playback of any track on any disc in magazine
- Programmed playback for up to thirty-two selections from any of the discs in any order
- Random-play function automatically selects tracks in random order
- Repeat single track, single disc, all discs, or programmed sequence
- Manual fast search with audible program, skip search in either direction
- Display window shows total time and number of tracks on loaded discs, disc and track number of selection being played, or track number and elapsed time of selection being played
- Analog low-pass filters
- Infrared remote control
- Rear apron has subcode connector for future digital accessories, one unswitched a.c. outlet, and line-level audio outputs



## LABORATORY MEASUREMENTS

**Maximum output level:** 1.85 volts  
**Total harmonic distortion at 1,000 Hz:** 0.0025% referred to 0 dB; 0.0032% referred to -10 dB  
**Signal-to-noise ratio:** 102 dB (A-weighted)  
**Frequency response:** +0.1, -0.7 dB from 20 to 20,000 Hz (average of both channels)

**Channel separation:** 102 dB at 1,000 Hz; 82.5 dB at 10,000 Hz  
**Cueing time:** 3.5 seconds (9 to 11 seconds when disc change is required)  
**Impact resistance:** top, A; side, A  
**Cueing accuracy:** A  
**Defect tracking:** successfully tracked all defects on Philips TS4A test disc

by the player's circuits) without any audible difficulty. When we drove 200-ohm phones from the PD-M6, the available volume was more than ample.

The final, and often the most difficult, test we apply to a CD player is to estimate its resistance to physical shocks in the form of slaps by the open hand on its external surfaces. The Pioneer PD-M6 proved to be exceptionally resistant to this sort of treatment, earning a solid A grade. It definitely does not have to be treated gently to avoid loss of tracking.

## Comments

Although we used the six-disc magazine for most of our tests of the PD-M6, we also played a number of discs one at a time with the single-

disc tray. Operationally, there were no detectable differences between them. Incidentally, there was some audible mechanical noise whenever a disc tray was pulled out of the magazine by the mechanism in the player and again as it was returned to it. We weren't disturbed by this noise, which is to be expected, and during actual playback the player was totally silent.

We have been impressed by Pioneer's unconventional and innovative approaches to digital-disc technology, first with the unique CLD-900 CD/LaserDisc player and now with the PD-M6. CD players may sound pretty much alike, but imaginative products such as these underscore the fact that there *are* some real differences among them.

**Circle 6 on reader service card**

# 1200 Baud Smart Duck

If it walks like a duck, sounds like a duck, and looks like a duck, it darn well better act like a duck. And ADC's new Hayes Compatible 1200 baud auto-answer/auto-dial modem is one heck of a duck. And, it's a market buster at just \$169.

By Drew Kaplan

Hats off to Hayes. They've just about written the book on specs and protocol for the 1200 baud modem market.

Every professional modem bills itself as 'Hayes Compatible'. But the big question is, how much does it really cost to make a top-of-the-line 1200 baud modem? Or, who's getting rich?

ADC's modem is made in the same factory, by the same people, as one of Hayes's biggest competitors. And, ADC is a division of BSR, the enormous half-billion dollar electronics giant.

So for \$169, you'll not only be getting a duck that quacks properly to Hayes modems, but sings like a nightingale to your pocketbook. It can save you a fortune in time with its extra features.

Don't forget. Now you'll get the \$39 value (DAK sold it for \$24) complete CompuServe Subscription Kit, including \$25 worth (Yes, that's twenty five dollars. Wow!) of on-line time, added by DAK, when you buy ADC's Modem.

## DUCK SOUP

Any computer with an RS232 standard serial port, will work flawlessly with this modem. And, virtually any modem or terminal software that's compatible with Hayes, will be compatible with ADC.

We've even got intelligent programs, cables, and interfaces (if you need them) to activate your IBM PC or Clone, and your Apple IIE or IIC. Of course, you can supply your own cables and modem programs for these computers or for any other computer you may own.

I've owned a Hayes 1200 baud modem for about 2 years. I just unplugged it and plugged in ADC's to operate my Hewlett-Packard dumb terminal which I use at home to monitor DAK's computer.

The only differences I noted were improved monitor sound, more screen displays and a help menu. And oh yes, one last extra. I use a few local data bases whose phone lines are always busy.

Well, ADC's intelligent modem recognizes a busy signal, hangs up and keeps retrying the number every 30 seconds.

There are less important (to me) extras like day, date and time, an extra phone jack and auto tone/pulse switching. So, you'll love it for discount services.

## DO YOU NEED TO KNOW?

Just think, you can transform your PC into a terminal that can interact with main-frames. You can download information from your main office computer and run Lotus, Wordstar, or you name it. It's all possible with your PC and modem.

You can exchange information with other computers. Say you're a writer, you can send a chapter from your home or office in Los Angeles to New York, have it edited and sent back to you.

You can even send it directly to typesetters and have a book or a newsletter prepared from your transmitted file.

It's really great when drafts of contracts are flying back and forth. Why retype everything over and over again?

Electronic mail lets you type in your message and you won't have to worry

## NOW WITH \$25 COMPUSERVE ON-LINE BONUS

It's An Added \$39 Value That DAK Sold For \$24  
Plus, you'll Get CompuServe's Complete Subscription Kit



about playing telephone tag any longer.

You can get the weather in Baltimore, the latest quote on your company's stock, or even reserve a seat on the next flight to Las Vegas. You can upload public domain software (there's an enormous amount of free software) or sample the newest programs before you buy.

There are pay data bases like CompuServe and The Source that have information about anything, and thousands of free bulletin boards about everything from Ham Radio to Parapsychology.

There's even a book that lists and describes such diverse data bases as one with 6500 references about coffee, to one with 2,000,000 on agriculture.

Of course, economics, medicine, law and computers are all well represented.

## THE TECHNICAL SIDE OR, WHY 1200 BAUD?

The ADC Modem will communicate at 1200 baud (about 120 characters per second) or 300 baud (about 30 characters per second) automatically, depending on the link at the other end.

So, it's clearly a decision of money and time. 1200 baud is roughly 400% faster than 300 baud, so if you transfer data across the country, you save 400% on your phone bill. And think of the time \$169 can save you!

If you download material from pay data bases, even though some charge more for 1200 baud, you still come out way ahead because of the amount of information you get per dollar.

It comes with a modular phone cord that you simply connect to any standard modular jack. And, it uses standard Bell 103 and 212A protocols. It operates in half or full duplex.

Its built-in microprocessors let you automatically answer in-coming (auto-answer) calls & act on all Hayes commands.

It even waits for dial tones and phone network tones during auto-dial. The modem is 9½" X 5½" X 2". It's backed by ADC's standard 1 year limited warranty.

## HOOKING IT UP MADE EASY

All you need is a serial output, a cable and a modem program. Use your own for any computer. Or you can use ours for the computers below. All our modem programs on disk let you save, upload

and download files. Look how easy it is.

If you own an IBM PC or a Clone, usually you'll find an RS232 serial port already built-in. All you need is our cable and modem program on disk, which we've packaged together for just \$29 (\$3 P&H). But, before you order your cable, you may need a short sex education course.

Sex Education 1A. You need to determine whether your computer's RS232 connector is male or female.

If you look at the picture below, you'll note that ADC's RS232 Modem connector has holes going in. It's a female. If it had copper pins sticking out, it would be a male. Now wasn't that simple?



So, if yours is female, order our male cable and modem program Or. No. 4353. If you have male pins sticking out, order our female cable, Order No. 4354.

If you don't have an RS232 port, we have a serial interface card for your IBM or Clone, complete with cable and modem program for \$99 (\$4 P&H). Or. No. 4355.

For your Apple IIC, your serial interface is built-in. All you need is our cable and modem program on disk. They are just \$29<sup>90</sup> (\$3 P&H). Order No. 4356.

For your Apple IIE, you'll need a serial interface with an RS232 port, a cable and a modem program. It's all yours for just \$89 (\$4 P&H). Order No. 4357.

## 1200 BAUD SMART DUCK RISK FREE

For business or pleasure, you'll communicate, gather information and save time. If you aren't 100% satisfied, simply return it in its original box to DAK within 30 days for a courteous refund.

To Order Your ADC 1200 Baud Intelligent Modem, now including CompuServe's Complete Subscription Kit (nothing else to buy), with \$25 worth of on-line time, risk free with your credit card, call toll free or send your check for DAK's market busting price of just \$169 plus \$6 P&H. Order No. 4334.

The OnLine Directory of over 1,100 Data bases, complete with descriptions

...Next Page Please

...Modem Continued is just \$14<sup>95</sup> (\$2 P&H). Order No. 4358.

The ducks be will sure to be quacking up a storm when they see BSR's factory direct, through DAK, price on this state-of-the-art 1200 baud intelligent modem.



### A LOOK AT COMPUSERVE & MORE

Get a date, check your stocks, leave E-Mail, or post messages on Electronic Bulletin Boards. Transfer files or download public domain programs. Let your computer bring you the wealth of elec-

tronic information that's on-line.

Imagine dialing a number and hooking up to a free Electronic Bulletin Board where people post messages about everything, from new jokes (I've signed onto a joke bulletin board.) to computer equipment they want to sell.

Most are free, some cost money. But until you are on-line yourself, no brief description that I can give you will even scratch the surface of what's available.

But, let's take a brief look at part of the menu (index) that you'll have at your fingertips when you log onto CompuServe. I've used CompuServe's names or descriptions. This is by no means complete. And CompuServe is just one of many data bases available to you.

No matter what your interests are, you'll spend hours on-line learning about things, making plane reservations or even playing logic games. And, on most bulletin boards, you'll find the numbers of other bulletin boards.

### PARTIAL COMPUSERVE INDEX

AIRLINES, ARTS (Art & Literature), ATARISIG (Atari Forum), AVIATION (Aviation Forum), BANK (Home Banking), BANSHI (Ban-shi Game), BROKER (Brokerage), Business (Business Menu), C64SIG (Commodore 64 Forum), CASTLE (Castle Telangard Game), CBIG (CB Interest Group), CBMSIG (Commodore Programming Forum), Clarke school (For the Deaf), COCO (Color Computer Forum), COM-MODITIES, CP/M, CQUOTE (Current Quotes), DEMOGRAPHICS (SuperSite), DISCLOSURE (Public Company Details), EARNINGS (Earnings Projections Menu), EASY (EasyPlex), ECONOMICS, EDUCATION, EMAIL, ENCYCLOPEDIA (On-Line Grolier's Academic American Encyclopedia), ENGINEERING (Engineering Menu), ENTERTAINMENT (Entertainment Menu), ENVIRONMENT (Environmental Forum), EPIE (EPIE Forum), FINANCE, FINTOL (Personal Finance), FLIGHTS (Travel Menu), FOOD, FORUMS (Menu of Forums), GAMES (Menu of Games), GOURMET (Electronic Gourmet), HEALTHUSERS (Health Users Group), HOBBIES (Hobbies Menu), HOLLYWOOD (Hollywood Hotline), HOME (Home Menu), HOTELS (A to Z Hotels), IBMNOVICE (IBM Novice Forum), IBMSIG (IBM Users Forum), INSURANCE, INTERESTS (Other Interests), INTERFACE, INVESTMENTS (Investments Menu), IQINTERFACE (IQ Interface Program), LAWSIG (Law Forum), LEGAL (Legal Menu), LEISURE (Leisure Travel Menu), LIBRARIES (Home Reference Menu), LOTUS (World Of Lotus), LOVE (Love Messages), MAGAZINES (Electronic Publishing Menu), MAUG (Apple Users Group), MEDICAL (Medical Menu), MOVIES (Movie Reviews), MSOFT (MicroSoft Users Group), SBP (Standard & Poors), SCI-FI (Science Fiction Form), SCIENCE (Science Education Forum), SHOWBIZ (Showbiz quiz), STATE (Department of State), SPORTS (Sports Menu), TECHNOLOGY, TICKER (Ticker retrieval), VACATION, VIDEO, WEATHER (NOAA Weather Wire), WINEFORUM (Bacchus Wine Forum), and MUCH MORE.

On one board, I found the numbers of 40 other boards. Wow, there's so much information, education and entertainment.

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# Computer Power Director

**Protect your computer and 5 peripherals from spikes, turn everything on and off from the front & swivel your monitor.**

By Drew Kaplan

It's great. Now you don't have to reach around the back of your computer to turn it on. And not only can you turn on each peripheral separately, you can turn them all on or all off with one switch.

But there's more. This all new Power Director is much more than just a fancy 'octopus' that supplies you with 6 outlets to get rid of cumbersome tangled cords.

It aids in the prevention of damage caused by voltage surges and spikes. It then goes on to filter your AC to help protect your equipment and data from line noises caused by power disturbing air conditioners, refrigerators and the like.

And look at this. It protects your equipment from itself. There are 4 separate filtered sections. So, your computer will be protected from your printer, modem or other peripherals.



### BUT IT'S CONVENIENT

There are 6 protected 3-wire outlets

on the back. 5 are switched from the front. One is unswitched but spike protected so you can leave a peripheral on.

Each of the 5 switched outlets has a non-glare status light so you know what's on. Push a button for on/off control.

You can swivel the monitor from side to side. So, if you have a separate keyboard, you can really type in comfort.

Above, you can see The Power Director between the Visual IBM® Compatible Computer and its monitor. It is 1 3/4" high, 13 3/4" wide and 12 3/4" deep.

You can use it with virtually any computer. (It can hang off the back up to 3 1/2 inches with no problem.) It's a perfect combination of convenience and protection for your computer system. It's backed by a limited warranty.

### PROTECTION & CONVENIENCE RISK FREE

I've only had my data wiped out once by a power surge. But, I had over 2 hours of irreplaceable 1st draft copy in my computer when it happened.

Now, I'm using my new Power Direc-

tors with 4 different computers. With this added protection, maybe I won't lose data again. And, I've learned to save my data much more often since my loss.

If you're not 100% satisfied, simply return it to DAK within 30 days in its original box for a courteous refund.

To order your 6 outlet Power Director with Spike Protection, Line Filtering, Circuit Breaker and a 10' 3-wire grounded power cable risk free with your credit card, call toll free or send your check for DAK's blockbuster price of just \$79 (\$6 P&H). Order No. 4623. CA res add tax.

I like the convenience. It's something that helps me every day. But, I'm thrilled with the added protection. If it even helps once, it's worth many times the cost.



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8200 Remmet Ave., Canoga Park, CA 91304

**\$49<sup>50</sup> BREAKTHROUGH!**



When you are at rest, so is your heart. A low resting heart rate usually means you're in good condition. Have you checked yours?



When you exercise, you should reach your heart's target zone. But, have I reached my exercise target zone, or just had too much coffee?

# Heart Window

**Now you can exercise, rest, swim or go out to dinner wearing the latest in computer pulse takers on your wrist. Plus, it's a talented sports watch and a formal dress watch too.**

By Drew Kaplan

It's a fact. You can tell a lot about yourself from your heart rate. You can evaluate the condition you are in, how much stress you are under, and how hard you should be exercising.

Think about it. How fast does your heart beat when you climb a flight of stairs? And how long does it take for your heart rate to return to normal?

Well, if you're at all like me, you may be a little out of shape. While I'm only 37, several friends of my own age have recently had heart attacks. And frankly, I'm getting just a bit worried.

You see, I am getting past the point where I can simply say, "I'll get back into shape next year."

So, whether you're a long distance runner (this is the ultimate jogging companion), or just a few pounds overweight like I am, your heart rate will give you a picture of your heart and body's condition.

Now you can take your heart rate anytime, anywhere with the newest in sophisticated electronic pulse takers.

And best of all, this heart computer is contained in a beautiful 24 hour alarm, 24 hour chronograph, LCD watch, that you will be as proud to wear with a coat and tie as you are when you're running.



## YOUR HEART'S TARGET ZONE

Your heart, just like any other muscle in your body, requires exercise. Unfortunately, unlike your arms, you can't see your heart's condition just by looking.

The type of exercise called aerobic exercise is specifically designed to exercise your heart. The purpose of aerobics is to reach your heart's target zone.

So what is your target zone? Your target exercise zone is between 60 and 80% of your maximum heart rate. And here's an easy way to figure it out.

Simply subtract your age from 220 beats per minute. So, for me at 37, my maximum heart rate is (220-37) or 183.

So when I exercise I should get my

heart rate up to at least (183 X 60%) or 110 beats per minute, and no higher than (183 X 80%) or 146 beats per minute.

With the Heart Window to help me, I can be sure that my workouts are valuable for my heart and neither dangerous escapades or total wastes of time. Of course, before beginning any exercise program you should consult your own doctor. Note: The Heart Window is designed to indicate your pulse rate and aid your exercise, not to make medical diagnoses. **BUT ISN'T EVERYONE DIFFERENT?**

Here's the really exciting part. The worse shape you're in, the faster you'll reach the target zone and the less work you'll have to do to stay in the zone.

You see, as you get in shape, your heart doesn't have to beat as hard to do the same amount of exercise. Just as when you work out with weights your arms become stronger, your heart becomes stronger with aerobic exercise.

So the Heart Window is safe for the beginner or the athlete. And, you'll really see your improvement as you exercise. **But you don't have to exercise.** Just wearing the Heart Window and using it at the office when you're under stress, after you've walked up some stairs or around the block, will make and keep you aware of your body's physical condition.

And look at this. Sit down at your desk and take your pulse. Then drink a couple of cups of coffee and take your pulse again. You'll see just what your morning 'pickup' actually picks up, and if, God forbid, you smoke, take your pulse before and after a cigarette. Wow!

## ALL ELECTRONIC

With Innovative's new Pulsemeter watch, you'll have supreme accuracy. It's like a direct electronic line to your heart.

You see, unlike other pulseimeters that use a light shining through your finger, or a microphone to take your pulse, this instrument actually measures the electrical impulses that cause your heart to beat.

The back of the watch is one receptor, and the metal touch sensor on the front of the watch acts as the other sensor. Just touch the sensor, and you'll see your pulse on the large LCD Display.

## IS IT A DRESS OR SPORTS WATCH?

Innovative Time thinks that everyone interested in their pulse must be a pro-

fessional athlete. So, they've built this watch with all the athletic extras.

It's not only water resistant, it's guaranteed to 60 feet (although you can't actually take your pulse underwater). It has a stopwatch, a lap timer, and dual finish mode. Its band is made of very tough polymers. So, it's a sports watch.

But wait, I don't like black watches for dress. So, I've gotten Innovative to add a deluxe matching stainless bracelet to the watch. It's rendered in stainless and black and is a perfect high fashion choice. So, it's a dress watch.

Plus, there's a 24 hour alarm and an hourly chirp. The stainless band is great for sports or dress. So, you'll get the watch with the black band on it and the high fashion band packed with it, compliments of Innovative Time's superb engineering and DAK's good taste.

The Heart Window is backed by Innovative Time's 1 year limited warranty and comes with a 1 year battery in place.

## TRY THE HEART WINDOW RISK FREE

Now you can look at your heart as easily as the time. You'll see how you react to stress, foods and exercise. Don't let DAK's low price confuse you. Take this pulse watch to your own doctor and have him test it.

Try the Heart Window risk free. Try exercising and then check your cardiac recovery rate. If you don't like what you see, you'd better keep the watch. But if you just don't like the pulse watch, simply return it within 30 days in its original box for a courteous refund.

To order your Heart Window, Pulse Sports/Fashion Watch, complete with 2 bands risk free with your credit card, call toll free or send your check for just \$49.50 plus \$3 for postage and handling to DAK. Order No. 9844. CA res add sales tax.

In the gym, at the track or at the office, you'll have a direct connection to the condition of your heart.



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# Fat Watcher Plus

Now you can walk or jog around the block, walk around the office or even around a trade show, and know how far you've traveled and how many calories you've burned. Use the alarm to set calorie and distance goals.

By Drew Kaplan

No, you don't have to be fat. And no, you don't have to be a marathon runner. However, if you are, you're going to marvel at the feedback you'll get from this new electronic Body Monitor.

Before we explore how you can use this Body Monitor's capabilities to aid you in losing weight (as it is me) and to measure your training achievements, let's look at some interesting curiosities.

If you're like me, you've probably wondered just how far you go when you walk around the block. And, every year I attend the Consumer Electronics Show and I've always wanted to know how far I walk.

Since my plane always seems to be at the last gate at every airport, I've wondered just how far I go. I've also been curious about how much ground I cover in an average day at the office.

Well now, not only will I know how many steps I've taken, I'll know how many miles or hundredths of miles I've gone and how many calories I've burned.

Now we will know it all. And, with the ability to set goals, we can use this monitor to help achieve our desired fitness.

## ONE STEP AT A TIME

It all starts out with one small step. Just clip the Body Monitor on your belt or waist band and away you go.

First it counts your steps. As you can see below, I've taken 1544 steps.



It knows how far you've gone because you set it to your particular stride length. As you can see, I've got mine set at 2½ feet. But you can set yours from 0 to 7'.



Because it knows your stride length, it automatically calculates the distance you travel. Just touch a button, and as you can see, I've traveled 0.58 miles.



Push the button again, and you can see how many calories you've burned. The Body Monitor has a built-in table that calculates an average of how many calories you've burned, based on the number of steps you've taken.

And, you can be even more accurate by adding your exact weight to the body meter's reading. A formula is included.



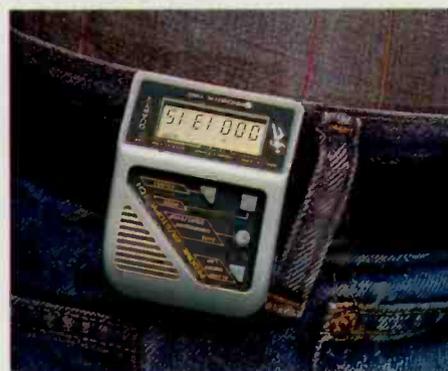
What's really great is that you can set a target for yourself to achieve. Here I've set 2500 steps. When I reach 2500 steps, an alarm will sound to tell me that I've achieved my goal.



But steps aren't very interesting, so you can set the alarm to let you burn 100 calories or go 3 miles. It's all calculated through the steps, so it's really easy.

Let's say I want to eat an ice cream sundae. It has 260 calories. So, I'd have to walk 5200 steps. I'm forgetting the piece of cheese or maybe even a cookie.

Using the Body Monitor for running or walking lets you see just what you've accomplished. And while I can't speak for you, I personally work and play best when I set goals.



The Body Monitor lets me set and achieve goals. So, it's been a terrific aid in my personal fitness program.

By the way, it's 1.03 miles around my block and I burn about 105 calories.

I'm really excited about finding out just how far I walk at the Consumer Electronics Show, but I'll have to wait till it opens in January to find out.

**SO MUCH MORE**

It may look small, but it has so much inside. It has a built-in clock with hourly chime, so you don't have to wear a watch.

It has a stopwatch, accurate to 1/100th of a second resolution. And not only does it have a lap timer, it has first and second place finishes.

But, with all its frills and all its great curiosity satisfiers, it's really a precision fitness aid.

So, if you walk, jog or exercise, the Body Monitor can aid in measuring what you've accomplished. It comes with a one year battery, and it's backed by a one year limited warranty by Innovative Time, the Pulse Watch People.

## SATISFY YOUR CURIOSITY RISK FREE

I've been dieting and exercising for years. I use my pulse watch all the time and it tells me how I'm doing. Now the new Body Monitor gives me feedback as to what I'm accomplishing.

And, I particularly like the goal setting alarms. Now, instead of watching my watch to see when I've run enough, an alarm sounds when I'm through. Plus, it's really neat to know how much ground you've covered around the office or around the block.

If you're not 100% satisfied, simply return it to DAK in its original box within 30 days for a courteous refund.

To order Innovative Time's Body Monitor with Step Counter, Mileage Counter, Calorie Counter, Stop Watch and Goal Setting Alarm, call toll free, or send your check for DAK's breakthrough price of just \$39<sup>99</sup> (\$3 P&H) Order No. 4651. CA res add tax.

It's great for fitness, but I'm wearing mine to work and even around the house. It's small in size, but it sure feeds back a lot of exciting information.

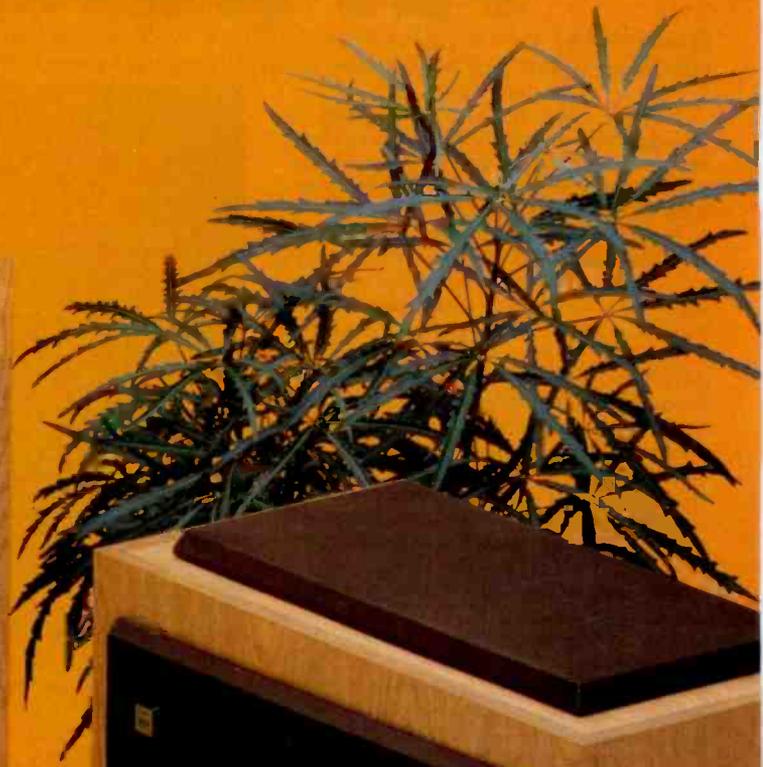


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# BSR's Endangered Colossus

Prepare for bone jarring bass and dramatically clear highs from these newly developed 15" 3-way 5 speaker systems that nearly missed their chance to charm an audiophile's ear. BSR moved its dbx and ADC divisions into one facility and these speakers almost became orphans. So now, they're yours at a close-out price.

By Drew Kaplan

It's a shame. But, it's also a great opportunity to get a pair of 15" audiophile loudspeakers with the newest in stereo imaging at a market-breaking price.

Imagine a precisely matched mirror image pair of top-of-the-line BSR speakers that can effortlessly recreate the cataclysmic impact of a full orchestral crescendo at full volume and yet offer flawlessly subtle sound detail to 21,500hz.

You'll thrill to thunderous bass all the way down to 26hz. Incredibly rich, full, vibrant sound at low volume will explode with life as you increase the volume.

But before we examine the front speaker complement, the twin overlapping crossovers and the top mounted sonic placement and ambiance speakers, let's see why they were almost orphaned.

You see, BSR, the half billion dollar electronics giant, is the parent company of two of the best names in up-scale audio, dbx and ADC.

Last year dbx developed a new multi-thousand dollar speaker system called the Soundfield One which lets you sit virtually anywhere in your room and have full stereo imaging and terrific sound.

BSR decided to consolidate ADC and dbx into one building (still 2 companies) and put all its speaker efforts into dbx.

## POOR JACK

Well, while dbx's engineers were off designing their multi-thousand dollar masterpieces, BSR's Senior Acoustical Engineer (he had been Fisher's Chief Engineer for 10 years during its top end component stereo days), was designing BSR's radically new speaker line.

The revolutionary top of the line 15" stereo imaging pair pictured above will let you enjoy superb stereo imaging without sitting directly in front of your speakers.

But unfortunately, in the consolidation move, BSR's speakers went by the wayside, and so did Jack.

Enter DAK. After a few fearful negotiations and considering the engineering costs BSR had already expended, they agreed to make the speakers just for DAK.

Because there's virtually no BSR overhead left on these speakers, and the R&D was all but complete, we've gotten these speakers for virtually the component costs plus a little BSR labor.

And don't worry about Jack. BSR had him finish the engineering (they really are great people) and they'll pay him a royalty on each speaker we sell. Besides, by the time you read this, Jack is sure to be snapped up as the Chief Engineer at another esoteric audio company.

## WHAT'S STEREO IMAGING?

Stereo imagery is the logical separation and interaction between channels. It's the successful creation of a panoramic wall or stage of music rather than the confined, easily located 2 speaker sound. IT'S WHAT'S INSIDE THAT COUNTS

Imagine the full thunder of a kettle drum, or the pluck of a string bass being explosively recreated in your living room. BSR's 15" sub-bass acoustic suspension driver will revolutionize your concept of

low clean bass.

Its magnetic structure weighs a thundering 48 ounces. But that's not all. The magnetic field is developed by the rare earth metal Strontium for state of the art massive but flawlessly controlled bass.

A 38mm voice coil with a 200° centigrade temperature capacity, will handle the most demanding digital or analog recordings. And, a new super rigid cabinet design virtually eliminates coloration due to uncontrolled cabinet resonance.

At low volume, the bass will fill in and envelop you. At high volume, your room, your walls and your neighbors will shake. (Not for apartment dwellers please.)



## MATCHED PAIRS

The mid-range and high end of BSR's speakers are truly unique. Front mounted 8" polypropylene mid-range drivers provide rich sound while top mounted 5" polypropylene mid-range drivers provide an open, lifelike ambiance.

Front mounted exponential horn tweeters provide awesome brilliance to 21,500 hz, while top mounted tweeters enhance separation because they are mounted to the outside edge of each speaker.

So, this system has a specific left and a specific right speaker. You'll find wide, but interactive separation that will vastly widen your ideal listening area.

The imagery will give the illusion of musicians actually playing in front of you. Your music will take on a three dimensional quality. You'll enjoy superb stereo imagery regardless of each speaker's specific placement in your room.

## MORE SPECIFICS

The exponential horn tweeters, both in front and on the top of these systems, employ 25mm rigid phenol diaphragms for stability and accurate response.

Polyamid-imid binders and ferro-fluid coolant allow for a 300% increase in heat dissipation so you can drive the voice coils up to 200° centigrade.

Now, the mid-range. Both the 8" front firing and the 5" top firing polypropylene drivers reproduce the mid-range frequencies like no ordinary speakers.

It's amazing that so many speaker manufacturers simply slap in 5" paper mid-ranges to reproduce what's really the major portion of the sound spectrum.

BSR's 8" and 5" polypropylene mid-ranges are rigid, exacting drivers that deliver incredibly pure uncolored sound.

They have matched 25mm voice coils, also protected by ferro-fluid and polyamid-imid to 200° centigrade. They are driven by powerful barium ferrite magnetic fields.

## NOT QUITE FINISHED YET

To prevent phase shift and cancellation, two totally separate crossover networks are employed in these speakers.

All frequencies below 800 hz are directed to the 15" woofer. The front system routes frequencies above 800hz to the 8" mid-range to take full advantage of its superb reproduction capabilities. Frequencies above 3400hz are routed to the horn tweeter.

The top mounted system routes only frequencies above 1200hz to the 5" polypropylene ambient mid-range driver, and frequencies above 3400hz are routed to the top sonic placement tweeter.

There are level controls for both the top and front mounted speakers so that you can voice the speakers to match your musical taste and environment.

Note: Only the top tweeters are mounted at the the edges. The front mounted tweeters are conventionally mounted for acoustical symmetry.

Each speaker is fuse protected for up to 200 watts peak, 150 watts continuous power. You can operate these super efficient speakers with as little as 20 watts.

## AND OH WHAT A PRETTY FACE

The speaker systems are 30" tall, 19 1/4" wide and 10 1/2" deep. Their lovely oak wood-grain appearance is enhanced by the dark removable grill cloths that beautifully contrast with the rich wood-grain tones. They're a statement of audio elegance when placed in any room. They're backed by BSR's 2 year limited warranty.

## A COLOSSAL DREAM COMES TRUE RISK FREE

You'll hear depth of sound at low levels that was previously unobtainable. And yes, when you crank up the volume, your music will explode with realism and drama.

Try these speakers in your own system. Then compare them at any Hi-Fi Store with any pair of speakers up to \$1000. If they don't beat all the competition hands down, simply return them to DAK in their original boxes within 30 days for a courteous refund.

To order your matched pair of BSR top-of-the-line 15" 3-way 5 speaker systems with unique stereo imaging risk free with your credit card, call toll free or send your check for DAK's market-breaking price of just \$298 for the MATCHED PAIR plus \$22 for Postage and Handling. Order No. 4352. CA res add tax.

It's a dream system for an audiophile. Sonically pure, thunderously powerful, these BSR speakers will make your future listening years an on-going fabulous, if not earthshaking experience.



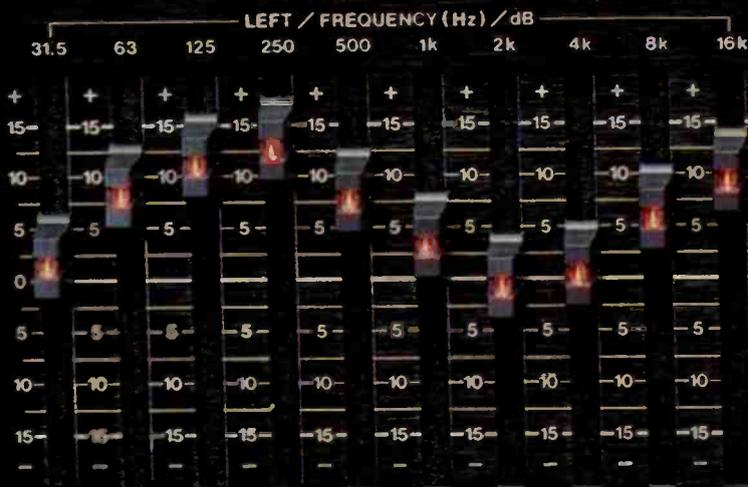
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STEREO FREQUENCY EQU



model

# Smart Sound Detonator

**Obliterate the wall between you and the individual instruments in your music. Infuse your own stereo system's sound with a breathtakingly vibrant 30 to 50% improvement in sound quality that you can measure with this superb BSR Equalizer/Spectrum Analyzer limited \$149 close-out.**

By Drew Kaplan

Close your eyes. Touch a button. And you'll hear your stereo system literally explode with life.

You'll hear the gentle brushes on a snare drum, the startling bone-jarring realism of a thunder clap, or the excitement of a full cymbal crash.

You'll hear string basses and other deep low instruments emerge from bass (that will sound murky by comparison), with such clarity and such definition that you'll feel you can almost touch each instrument.

This astoundingly distinct yet powerful bass adds such a full bodied warm feeling to your music, you'll feel as if you've been lovingly wrapped in a warm soft blanket on a cold winter's night.

But don't take my word for the sound quality improvement. With the Pink Noise Generator, Calibrated Electret Condenser Mike and the 220 Element Spectrum Analyzer, you can instantly measure each and every improvement you make.

Plus, there's more. A subsonic filter effectively adds the equivalent of many watts onto the power of your amplifier.

Plus, with its provision for two separate tape decks including two way dubbing, you'll have much more than just greatly improved sound.

You can count on great sound from this top of the line Equalizer/Analyzer. It has a frequency response from 5hz to 100,000hz  $\pm$  1 db. And, it has an incredible 100db signal to noise ratio.

BSR, the ADC equalizer people, make this super Equalizer/Analyzer and back it with a 2 year standard limited warranty. Our \$149 close-out price is just a fraction of its true \$379 retail value.

**FIRST THE EQUALIZER  
YOUR STEREO'S HIDDEN SOUNDS**  
Your stereo can sound incredibly bet-

ter. Just a 5db roll-off at the high end, up around 14,000hz to 16,000hz, can just decimate the harmonics that give you the open feeling you'd experience at a live concert. A similar roll-off at 60hz, causes the fundamental bass notes to just fade away into the 'murk'.

An equalizer isn't some magical device that manufactures sounds that don't exist. Most of the frequencies that will make your music really vibrant, are actually already recorded in your music.

You'll be able to prove this with a few simple tests we'll try when we discuss the Spectrum Analyzer.

You see, certain frequencies are simply not reproduced with as much volume as are the mid-range frequencies which stretch from about 800hz to 2,000hz.

An equalizer simply lets you establish accurate control of all frequencies to fit your equipment, your recordings, your taste, and your listening environment.

## TOTAL MUSICAL CONTROL

And, what a job it can do. It's totally unlike bass and treble controls which simply boost everything from the mid-range down for bass, or everything up for treble. You can boost the low-bass at 31.5hz, 63hz and/or 125hz to animate specific areas or instruments.

And, when you boost the part of the bass you like, you don't disturb the mid-range frequencies and make your favorite singer sound like he has a sore throat.

The high frequencies really determine the clarity and brilliance of your music. The problem is that highs are very directional. Wherever you move in your listening room, you'll find a big difference in high end response, as you'll see when we test the Analyzer.

No recording engineer or equipment manufacturer can even begin to control your listening environment.

You can control the highs at 4,000hz, 8,000hz and/or 16,000hz, to bring crashing cymbals to life at 16,000hz while at the same time you can cut tape hiss or annoying record scratches at 8,000hz.

But there's more. Don't leave out the mid-range. You can boost trumpets at 300 to 500hz or a clarinet at 1000hz. You can boost or cut any part of the frequency spectrum a full  $\pm$  15db.

## TAPE DECK HEAVEN

You can push a button and transfer all the equalization power to the inputs of two tape decks. Now you can pre-equalize your cassettes as you record them and get all the dramatically enhanced sound recorded right on your cassettes.

This is an especially great feature when you play your cassettes on bass-starved portables or high-end starved car stereos.



## SIMPLY PLUG IT IN

Use your tape monitor circuit, but don't lose it. Now your one tape monitor circuit lets you connect two tape decks.

Just plug the equalizer into the tape 'in' and 'out' jacks on your receiver or preamp. We even supply the cables.

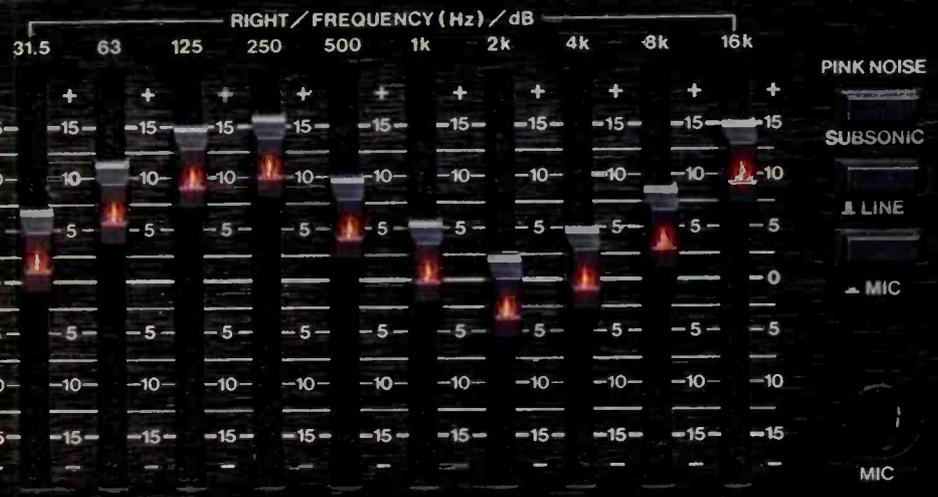
As you listen to your records, FM or any 'Aux', any time you push the tape monitor switch on your receiver you'll hear your music jump to life.

The output from your receiver is always fed directly to your tape deck(s) for recording, and with the touch of a button, you can choose to send equalized or non-equalized signal to your deck(s).

When you want to listen to a tape deck, just select which tape deck you want, turn the switch on the equalizer,

**\$149 CLOSE-OUT**

**R / SPECTRUM ANALYZER**



8000

and your tape deck will work exactly as it did before. Except, now you can listen with or without equalization.

Look at this. You can dub tapes from deck 1 to deck 2, or from deck 2 to deck 1 with or without equalization.

**THE SUBSONIC FILTER**

Much of the power drawn from your amplifier is used to drive your woofers. When you drive the amplifier too hard, it clips and you end up with distortion.

A subsonic filter removes a lot of non-musical material you can't hear that exists below 20hz. So, it relieves your amplifier of a lot of work. It doesn't actually create more watts (Please, no letters from my 'technical' friends) for your amplifier.

But, it's like turning off the air conditioning in your car. It saves you using about 7hp of what you have. And therefore, you'll have more watts for clean powerful sounding music.

**THE SPECTRUM ANALYZER**

Now you can scientifically analyze your stereo listening room and test your equipment by using BSR's Real Time Frequency Spectrum Analyzer.

Plus, you'll see your music not as a single level on a VU meter, but as a kaleidoscopic parade of 10 individual 20 element VU meters.

Each is tuned to a specific octave of the sound spectrum. An eleventh 20 element meter averages all levels.

The effect is awesome. You can visually isolate a string bass or cymbal, and actually see each individual instrument almost as a wave moving across the 220 individual florescent elements.

**THE MOUTH AND EARS**

It talks. The Analyzer speaks with a voice of pure calibrated Pink Noise. Pink Noise is the standard composite 'sound' of all frequencies used for testing in labs around the world. All frequencies from 20hz to 20,000hz are generated at the exact same level at the exact same time.

It listens too. If you are testing a cassette or a component in your system, use the 'Line Button'. If you're testing your whole system with speakers, use the matched calibrated electret condenser

microphone (included). Either way, you'll have a quick, easy and accurate way to evaluate the total sound of your system.

**HOW TO TEST**

**SPEAKERS, EQUIPMENT AND TAPE**  
Testing your speakers in your listening room is the really crucial test. Simply place the calibrated microphone where you normally sit to listen to your stereo.



At the end of an 18 foot cord is the ear of the system. Just clip the mike wherever you sit and test your room.

Turn on the Pink Noise. You can switch to Left Channel, Right Channel or both. There's a meter range button, a sensitivity control, and even a switch that lets you freeze the meter.

Just sit down at the equalizer. Start with one channel. You'll see all 10 octave bands on the meter. Just slide the corresponding controls to increase or decrease any area that needs help.

You have now set up your system to its maximum capability. But as you'll see, location is very important. Move the microphone 5 feet to the left or right.

Then turn on the Pink Noise and check the Spectrum Analyzer. Now you can see why the specifications that come with your system are only a starting point.

Here's a way to test your tape deck and tape. First record Pink Noise for 3 minutes at -20VU. Then play it back and note the readings on the meters.

Now, record the Pink Noise again at 0VU or +3. Wait till you see how much the high end falls off. Now you'll see why all specifications are listed at -20VU.

With the Equalizer/Analyzer you can enjoy the finest stereo sound from your system and be a test lab too.

**WHY SO CHEAP**

BSR now only sells equalizers under their ADC name. Well, as Detroit comes out with new cars each year, ADC comes out with new equalizers. We got them to supply us with just 30,000 of last year's

ADC model before they shut it down.

They had already paid for all the tooling, all the research and design, so we were able to buy these for less than half the normal price, for cold hard cash.

**THE FINAL FACTS**

There are 20 slide controls, each with a bright LED to clearly show its position. Each control will add or subtract up to 15db. (That's a 30db range!)

There are separate sound detonation slide controls for each channel at 31.5hz, 63hz, 125hz, 250hz, 500hz, 1,000hz, 2,000hz, 4,000hz, 8,000hz, and 16,000hz.

BSR backs this top of the line Graphic Equalizer/Spectrum Analyzer with a 2 year standard limited warranty. It is 17 1/2" wide, 3 1/2" tall and 8 3/4" deep.

**MAKE YOUR MUSIC EXPLODE RISK FREE**

It's startling. Music so vibrant with life you'll swear it's 3 dimensional. Sculpture your music any way you want it. If you're not 100% satisfied for any reason, simply return it to DAK within 30 days in its original box for a courteous refund.

To order your BSR EQ3000 Smart Sound Detonator 10 Band Graphic Equalizer with Real Time Spectrum Analyzer and Calibrated Mike, with Subsonic Filter and Two Way Tape Dubbing risk free with your credit card, call toll free, or send your check, not for the \$379 retail value. Don't even send the \$227.97 dealer cost. Send just \$149 plus \$8 for postage and handling. Order No. 4100. CA res add sales tax.

The sound of your stereo will explode with life as you detonate each frequency band with new musical life. And, you can see and measure exactly what you've done.



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# Surround Sound & More Explained

*Journey into space, down mountains or through meadows as you sit in front of your TV. Now the bigger than life sound of a movie theater comes to your living room. Just wait till a space ship warps right through your couch!*

By Drew Kaplan

It's awesome. Cars will race out of your TV and through your room. You'll jump because gun shots are so real. And, if you're walking through a meadow, you'll hear crickets and birds all around you.

This is just the tip of the iceberg of the effect that you can expect when you connect this Surround Sound Processor to your stereo VCR or even monaural VCR.

## WHAT IT IS

There's just no two ways about it. You are right in the middle of the action. If you're watching an avalanche, you're in it.

If there's a storm, you'd better get your rain coat. Battles will be waged and you'll be right in the middle. And, it's all in your grasp, now!

This new Surround Sound Processor takes the stereo signal from your VCR (read on for monaural) and produces dramatic sound through its two front, shielded 2-way speaker systems.

Well, big deal. That's what you get from stereo. Ah, but hold on to your chair. Because, there are over 700 movies that have Dolby® Stereo Surround Sound encoded on them. Note: Most tapes just say Dolby® Stereo, not 'Surround', on them, but wait till you hear the effect.

Surround Sound has infused movies with life when you have been at a theater. But, now you can decode them at home.

The Surround Sound signal is obtained by matching the Left and Right Channel Phase relationships and sending the difference to the rear.

The engineers create these phase differences to provide the special effects from the rear. And let me tell you, it will knock you right out of your easy chair.

You'll also have variable rear delay to add to the rear speakers' effect. You'll have massive 3 dimensional movement.

So, unlike stereo where things only move from side to side, now they can also move from the front to the back.

Moving from 2 to 3 dimensional sound is mind boggling. There's absolutely no limit to the locations in your room from which any specific sound can come.

## FIRST FOR STEREO

Switch in Surround. You'll hear the movements begin all around you. You'll

hear laser blasts from the left, applause from all around you when you're at a ball game, or a freight train approaching you from the rear. Watch Out!

If the movie you are watching doesn't have Surround or you're watching Stereo TV, switch to 'Stereo'.



You'll receive a very powerful version of Surround that is created by this processor. You'll still have full front stereo.

Plus, you'll have the variable ambiance and movement cues from the rear. In fact, in many cases you'll find 'Stereo' to be even more powerful than Surround.

There's a second stereo button called 'Music' that is especially designed to add only ambiance to the rear, for musicals and music videos.



## BUT IS MONAURAL DEAD?

You haven't been left out. There's a third switch which infuses your monaural VCR or TV station with resounding life.

It's a highbred stereo synthesizer. First it synthesizes stereo for the front speakers. Then it synthesizes a third channel for the rear action effect.

Add the variable ambiance delay and you'll have sound all around you. It's amazingly full and rich.

You'll have all the effect of a star ship going through your room. But, it won't be with the precise location detail of the Surround Signal itself.

Don't despair. It's terrific. It's full and alive. If you don't have a stereo deck for direct comparison, you'd swear that you had real Surround Sound.

It's amazing. Your viewing of TV or video will never be the same again.

## EASY INSTALLATION

It's easy. Just put it on top of your VCR or TV. Then connect the audio output(s) from your monaural or stereo VCR to the decoder. And look at this. You can switch between two video sources.

Anyway, the rest of the installation consists of hooking up the 4 speakers. Put two in front and two to the side or rear (wire included) and you are ready for thrilling, throbbing AV excitement.

## ALL THE CONTROLS

You'll have control of everything. Of course you can select input 'A' or 'B'. And you can select Surround Sound, Stereo, Synthesized Stereo or Music.

There's a master volume control. Plus, there's an input level control. And, there's a rear effects level control.

You can also delay the amount of ambient delay from 10 to 30 milliseconds. Plus, there's balance, bass and treble.

The speakers are a specially sealed acoustic suspension design. You'll be amazed at the massive sound created by the 4 woofers and 4 tweeters. It's made by Universal, the cable specialists, and it's backed by their limited warranty.

## EXPLODE YOUR CONCEPT OF VIDEO RISK FREE

The realism of a space ship warping through your living room is unparalleled. If you aren't 100% enthralled, simply return it to DAK within 30 days in its original box for a courteous refund.

To order Universal's Video Surround Sound, Stereo, Synthesized Stereo and Music decoder and enhancer that will explode your concept of the capabilities of home video risk free with your credit card, call toll free or send your check for DAK's breakthrough price (including all 4 speaker systems) of just \$199<sup>90</sup> (\$12 P&H) Order No. 4690. CA res add tax.

Move from one or two dimensional video viewing to live, center of the action, thundering, 3 dimensional video sound.



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SAME OLD DOG, BRAND NEW SUBWOOFER

# 15" Thundering Subwoofer

Man's best friend meets the audiophile's best friend at an earthshaking bone jarring new price. Now you can add the impact of a 15" subwoofer to any stereo system for just 99<sup>90</sup>.

By Drew Kaplan

A puppy may be man's best friend. Woof, Woof. . . But, now I've got a new friend you can add on to your stereo system. It doesn't need to be taken on walks, washed or fed. But, it makes a great cocktail table for you when you're being fed. And, oh what a woof it has.

## GREAT SOUND FOR EVERYONE

It's called a subwoofer. And, normally it is the beloved pet of only the most ardent audiophiles.

It's not generally understood that it can be used with virtually any speaker system in any stereo. And, in addition to substantially increasing and perfecting the bass response, it has a significant impact on the mid-range clarity too.

Before I tell you exactly how marvelous your stereo will sound when you connect this subwoofer to it, there are two things you should know.

First, you'll be getting your new friend at a phenomenal price. DAK has sold over 10,000 of Cerwin-Vega's 12" subwoofers. They had a retail price of \$332, but we sold them for \$164<sup>50</sup>.

Second, your new friend comes complete with a paid up health insurance policy in the form of a 2 year limited warranty from its father, BSR.

By the way, the puppy sitting on top of the subwoofer is the same puppy I used with Cerwin-Vega's, but wait till you hear what's under him now. You'll have BSR's 15" massive infusion of explosive bass, added to your system for just \$99<sup>90</sup>.

But don't be misled. BSR bass is clean and tight; never sloppy or overpowering. It adds a feeling of depth and fullness to your music that you simply can't get with two or 3-way speaker systems.

## HERE'S WHAT IT DOES

Basically, the problem with most speaker systems is that the bass overpowers the system. In a 3-way system, a woofer may be crossed over at about 800hz. And, in a 2-way system as high as 3000hz.

So, the woofer must handle movements of up to an inch at frequencies below about 80hz, while at the same time attempting to reproduce the very fine vibration type movements of the mid-range frequencies.

It is this difference in movements that causes both the bass to be weak or not precise, and the mid-range to become muddy (intermodulation distortion).

Even the best 3-way systems fall prey to these problems. And, it's why a subwoofer can do so much for your mid-range clarity as well as your bass.

## PROBLEM SOLVED

BSR's subwoofer has a specially engineered crossover network that sends frequencies above 120hz to your regular speakers and reproduces just the mammoth movement frequencies from 120hz down to 22hz with a special floor firing dual wound super subwoofer.

If you have downstairs neighbors, this subwoofer isn't for you. The woofer is a very special hybrid. It has a mammoth one and one half inch voice coil which allows the speaker to make the very large



movements required to reproduce the very low frequencies.

But, it would do a lousy job of reproducing mid-range, which is why, cost aside, manufacturers don't put big voice coils in normal 10" or 12" woofers.

To make the massive movements accurate, this woofer has a very large magnetic structure. This magnetic structure also makes the subwoofer system extremely efficient. (The sensitivity is 91.5 db at 1 watt at 1 meter.)

So, whether you have two or three-way speaker systems, with 8", 10" 12" or even 15" woofers, you'll find the sonic improvements staggering.

You'll hear and feel the awesome effect of thunder rumbling through your home. You'll hear a depth and dramatic fullness to your music that won't be heavy but will thrill you with its massive strength.



Here's a 'floor's eye view' of the subwoofer. You'll feel and hear bass so alive, you'll think it is.

## EASY HOOKUP

It's easy to connect. Simply run the right and left speaker wires from your amplifier to the input terminals of the subwoofer. It works with any system from 20 to 150 watts per channel.

Then, you simply connect the speaker

wires from your two standard 8 ohm stereo speaker systems to the output terminals on the subwoofer. They receive the exact signal that they did before except that everything from 120hz down is routed only to the subwoofer.

Placement of your regular speakers is just as critical as usual for stereo imaging, but the subwoofer can be placed anywhere because low frequency material is totally non-directional.

The subwoofer makes a perfect cocktail or end table. Its rich wood-tone appearance matches any decor. It is 24½" long, 16¼" high and 20" wide.

## TRY AUDIOPHILE'S BEST FRIEND RISK FREE

The fullness, richness and depth is awe inspiring. Wait till you connect this subwoofer to your system and experience truly massive force from your music.

If you aren't 100% satisfied, simply return it to DAK in its original box within 30 days for a courteous refund.

To order BSR's Thundering Subwoofer with its dramatic 15" Dual Wound Voice Coil Subwoofer risk free with your credit card, call toll free, or send your check for DAK's breakthrough price of just \$99<sup>90</sup> (\$14 P&H). Or. No. 4514. CA res add tax.

You can't replace the love and softness of a warm puppy. But, wait till you experience the richness and depth this subwoofer will add to your bass and the clarity you'll hear in your mid-range.



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# Remote Control Blowout

## Command Consoles, Modules & Computer Interfaces

Burglars will think you've got a family of 10 at home when you're out. And, you'll feel like you've got a butler, 2 maids and a security guard when you're home. And now, for just \$19<sup>90</sup> you can interface your computer.

By Drew Kaplan

It's late at night. You're in bed. The lights are romantically low. The stereo that is playing in the background, as well as your lights, will be automatically turned off after you're asleep.

As you peacefully drift off, you'll be secure in the knowledge that to a burglar on the prowl, your family still appears to be moving about.

### CHEAP THRILLS

Romantic lighting, burglar deterrents and energy saving controls, are just the beginning of this remarkable, installation free, remote control system.

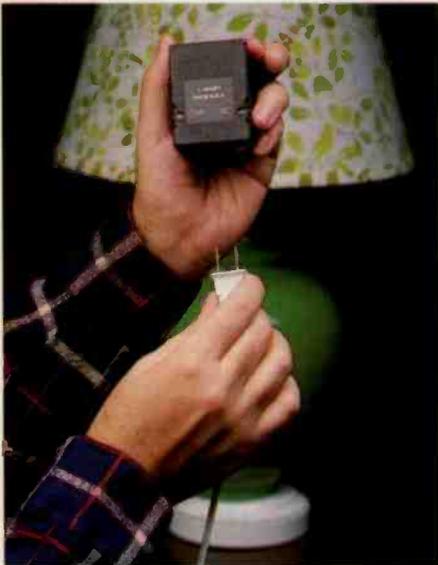
Now you can remotely turn on, off and dim your lights, thwart burglars, and even turn the lights on or off in an unattached garage or barn.

It's exciting. Just imagine effortlessly retrofitting your home for remote control without running a single wire.

From my own nightstand, I can dim the lights in the bedroom, turn off my son's TV and turn on our outside security lights or all the controlled lights in the house. Wow!

This instant remote control system simply plugs-in in seconds and consists of inexpensive space age control modules and command centers.

It actually uses your existing house or office wiring. And if you can plug in a lamp, you can plug-in this system.



### THE COMMAND CONSOLE

Imagine that you're watching TV. You can dim the lights from your easy chair. If you hear a noise, touch a button and your outside flood lights jump to life.

It's all easy when you have this top of the line Command Console, shown above, sitting next to you. It can let you control up to 16 different lights and appliances.

You can turn each on or off. You can dim or brighten lights. And look at this. You can turn all your controlled lights on or off for instant security with the 'All On' and 'All Off' buttons on the console.

You can even move it from room to room because its total installation consists of simply plugging it in. Or, at DAK's



super low price, you can put Command Consoles in as many rooms as you wish.

No matter where a Command Console is, you can control lights, fans, TVs, and stereos anywhere in or around your home.

### HERE'S HOW IT WORKS

As you push each button on the command console, a powerful but silent, encoded signal is sent down its AC cord into your home or office wiring.

This safe, silent encoded signal, travels throughout your electrical system. And, it won't disturb your TV or your FM.

It can even reach your unattached garages, barns, sheds and even your pool light, porch lights and yard lights.

Wherever you want to control a light or appliance, all you have to do is plug-in one of the system's controller modules.

Each module has a rotary dial numbered from 1 to 16. Just dial in a number to match one of the 16 number buttons.

Then, just plug the module into the wall and the lamp or appliance into the module for instant remote control.

**Important note:** You will still have local control of all your lights and appliances by just using their normal switches, even though they are plugged into modules.

Each module actually senses when you turn the controlled unit's switch and automatically relinquishes control.



There are separate modules for lamps that have full range dimming capability from 0% to 100%, and handle up to 300 watts. There are appliance modules that have no dimming but can handle up to 500 watts, or 1/3hp motors.

And, there are even light switch modules that have both full dimming and 500 watt capability which you can install instead of your present wall switches.

You can move the modules from place

to place or change their code numbers in seconds. And of course, if you move, your system goes with you.

### THE TIMER

This sophisticated electronic brain can perform 32 tasks. Just plug it in and you're in operation.

Select the module number you want to control, then decide if you want the controlled device to come on or off.

If you only want something to happen once, just push the 'Once' button.

There is a 'Daily' button that lets what you've programmed occur every day.

There's a 'Security' button. You can program lights and radios to give your house a lived-in look when you're away.

With The Timer, you can set your window air conditioning to come on an hour before you return from work.

Or, you can have your porch lights come on so you'll never enter a dark house. You can set your hall light to come on at 11PM and off at 6AM. And you can have your electric blanket shut off at 7AM and come back on at 10PM.

### TELEPHONE CONTROL TOO

You can even phone home and control anything. Just plug it into both your AC line and any modular phone jack in your home or office.

Then just call your regular phone number, hold up its 'beeper controller', give your 3 digit code that you set yourself, and start controlling.

You can call home and turn on your lights before you leave work or before you leave a midnight party. It's a great security device.

### SOME NEAT IDEAS

You'll find the system changes and bends to meet your exact needs. You can set several modules to the same number so that the front and rear lights can come on together.

Or, you can set all the lamps in a room to come on and even dim together.

You're sure to want a module in your dining room. Eating by subdued light is a real pleasure. And it's important to remember that not only do you get full remote control, you get 0% to 100% brightness control of your lights.

It's like getting free dimmers thrown  
...Next Page Please



... X10 Continued in with your remote control system. So, for bedside lamps, swag lamps, ceiling lights, track lights and garage lights, you'll be in full command.

And, you'll automate your fans, coffee-maker, humidifiers, and crock-pots.

With a little imagination, you can adapt other electronic devices that will let you water plants, control green houses, and of course, make use of audio cassette decks with 'timer ready' switches.

And, if you own a second home, now you can activate pipe heaters if there's an early frost, or 'switch on' the house so it's warm or cool and lit when you arrive.

#### QUITE A SYSTEM

As you get into bed tonight, think about what you'd do if you heard a noise outside or downstairs. Just push a button.

Think about how nice dimmed lights would be in your bedroom or living room. If you're at all like me, you'll love all the 'plug-in' things you can do with X10.

#### 19<sup>90</sup> COMPUTER CONTROL TOO

It's amazing. Look at your computer screen. Pick a lamp anywhere in your home and touch a button. Both the lamp on the screen and the 'real' lamp will jump to life. And, it's yours for just \$19<sup>90</sup>.

You can choose 10% to 100% intensity. And, not only can you turn anything you choose 'on' or 'off' right now, you can program the device to come 'on' or turn 'off' multiple times today, tomorrow, or any day(s) you wish during the week. **USE YOUR COMPUTER-DON'T LOSE IT**

What's really neat is that you can operate the system directly from your computer, but you store all your programmed instructions in X10's 80C48 microprocessor based Control Center.

And look at this. The Control Center instantly connects and disconnects from your computer without tying it up.

The control center has battery back up (9V battery not included), and you can back up all your stored commands on the copyable X10 master disk.

So, not only is your programming protected, but you can store summer, winter, and vacation schedules on disk.

In fact, although the included software supports at least 95 devices (minimum, depending upon which computer you own), you'll have access to 256 command capabilities. So, you can program anything you like. Imagine all the excit-

ing things you can program your computer to do. Wow!

#### FULLY COMPATIBLE

DAK has over 70,000 customers with X10 systems. The standard modules that you already own are 100% compatible. So, for \$19<sup>90</sup>, how can you go wrong?

How is it done? Well, your computer tells the Command Center what you want done. The Command Center then sends a silent encoded signal throughout your home's electrical system.

If it says, "Number 7 module turn on to 40%", only number 7 will respond. Of course, groups of modules can be controlled and you can assign several lights, such as outside flood lights, to the same number. It's all easy. It's all flexible.

#### BACK TO THE ACTION

OK, you're sitting at your Commodore or Apple IIE or IIC Computer. You'll see pictures of a variety of rooms. Just tell your computer what types of devices you'd like to control.



Whenever you would like to place a lamp or appliance, just choose one from a screen like the one shown above. These pictures, or ICONS as they are called in computerese, will appear. There are many types of devices to choose from.

If you were at your IBM PC you'd see text. (You can even control your whole office or factory.) If you were at your Macintosh, you can draw your own rooms, even using Macpaint. Wow!

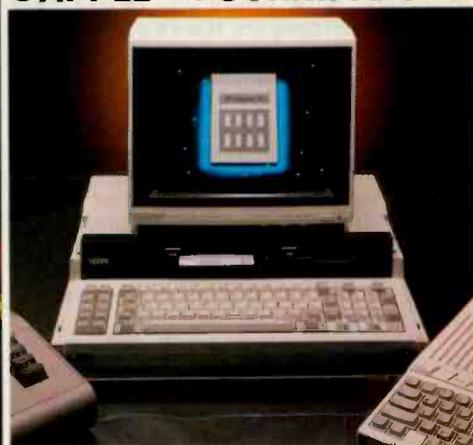
So, with Command Consoles or with your computer, or with both, you'll have control never before possible of electrical devices in your home or office.

Wait till you feel the power of your computer surging through your home. A security mode can make your lights come on and off at random times for security. You can even manually control 8 devices

## \$19<sup>90</sup> BLOWOUT

Computer Interfaces were originally \$129 for:

- IBM
- MACINTOSH
- APPLE
- COMMODORE



from the Console itself.

All Command Consoles, Modules and Computer Interfaces are backed by X10's standard limited warranty.

#### FINAL CLOSE-OUT RISK FREE

It's simply thrilling to use. It's security. It's convenience. And, it's fun.

If you aren't 100% satisfied, simply return any component to DAK in its original box within 30 days for a refund.

To order Any Combination of Command Consoles, Modules and Computer interfaces call toll free, or send your check for the amounts shown below.

Order any combination of Command Consoles and modules you desire.

1) The Control Console-Lets you control up to 16 different modules. On/off/dim/all on/all off. Just \$19<sup>90</sup> (\$2 P&H). Order No. 4622.

2) 32 Event Clock Timer-Lets you control 8 modules with up to 2 on and 2 off commands to each. Also acts as a command base plus sleep and security extras. Just \$26<sup>90</sup> (\$2 P&H). Or. No. 9777.

3) Telephone Responder-Phone home and control 8 devices. It's also a base. It's just \$39<sup>90</sup> (\$3 P&H). Order No. 9778.

4) Lamp Module-Controls/Dims lamps up to 300 watts plugged into walls. Just \$11<sup>90</sup> (\$1 P&H). Order No. 9779.

5) Wall Switch Module-Controls/Dims lights now controlled by wall switches. 500 watt capacity. Just replace your wall switch with this automated module. Just \$12<sup>90</sup> (\$1 P&H). Order No. 9780.

6) Appliance Module-Control stereos, TVs, or anything with motors. 15 amps, 500 watts, 1/3hp rating. Just \$11<sup>90</sup> (\$1 P&H). Order No. 9781.

An X10 Computer Home Controller complete with Appropriate Software Disk and Cable is just \$19<sup>90</sup> (4 P&H).

7) For your Commodore 64 or 128, it simply plugs in. Use Order No. 4378.

8) For your Apple IIE or IIC, use Order No. 4379. Note: For the Apple IIE only (the IIC has one built-in), you'll need a serial interface (same as for a modem). It's just \$79 (\$2 P&H). Order No. 4380.

9) Most IBM PCs & Clones have a serial port, so X10 should simply plug in. Use Order No. 4410.

10) For your Macintosh, the X10 simply plugs in. Use Order No 4411.

Commodore, Commodore 64 & 128 and Apple, Apple IIE, IIC, Macintosh & Macpaint, IBM & IBM PC are registered trademarks of Commodore Electronics Ltd and Apple Computer and International Business Machines.

# Answering Attack Phone

Let's vanquish the problem of bulky complicated answering machines. And let's conquer the problem of lost beepers. Now when you're out, just the sound of your voice is all you need to retrieve your messages.

Stamp out beepers. Here's a microprocessor controlled answering machine that's so smart it will give you your messages without using a beeper.

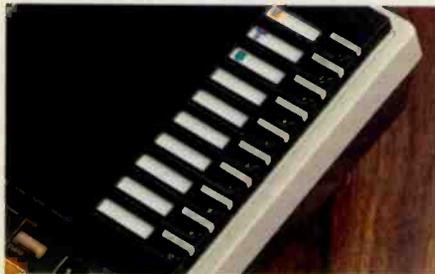
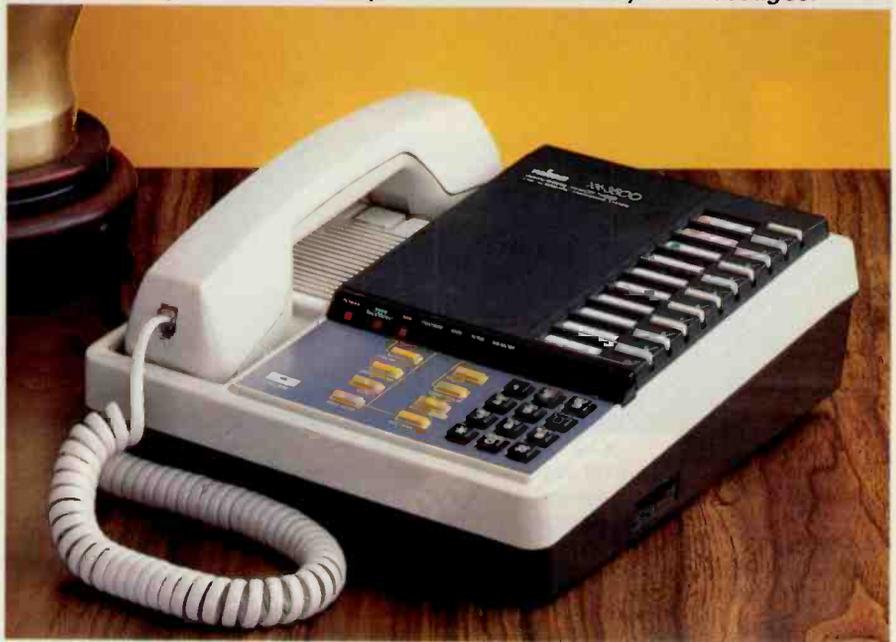
But, before we explore just how easy it is to use and all of its sophisticated features, such as, toll saver, 2-way record, and remote saving or erasing of messages, let's take a look at the phone.

Like the answering machine, the phone has attacked wasted motion, complicated commands and uncomfortable fit with the latest in technology.

Here's a phone that will dial any of your 10 most frequently called numbers with the touch of a single button. Just touch another electronic button and the phone will operate in Tone or Pulse.

Another button gives you instant redial. And, as for comfort, well just wait till you cradle the great sounding Phone Company style handset on your shoulder.

This phone which can be desk or wall mounted, is no larger than a conventional feature phone. It's just 9" deep and 8½" wide. And, a standard instantly changeable audio cassette (included) is concealed just to the right of the handset.



## VANQUISH THE REST

Easy to use. Forget cumbersome 'fixed time' outgoing announcements. Most machines make you fill a 20 second continuous loop cassette.

If you've ever tried to do this, you know just what a pain it is to make your message just the right length. With the Attack Answerer, just push 'Record Announcement' and talk into the built-in microphone from 2 seconds to 50 seconds.

After you've recorded your announcement, the machine will automatically play it back for your approval.

When you get your first call, it will be answered on the 4th ring. (Read on to see why.) If you're at home, you'll hear the message being left by the caller over the built-in speaker if you desire.

If you wish to talk to the person, just pick up the receiver and start talking. If you don't, you've just experienced the privacy protection called 'call screening', which lets you hear who's calling before you decide to answer.

This machine will let your caller leave any length message up to one minute long. If they hang up in 20 seconds, that's how long the message will be.

If they don't choose to leave a message, the machine will ignore the call. So, when you play back your messages, all you'll hear are messages, no dead space. And of course, you won't have to listen to your own announcement between each message you receive.

## TOLL SAVER, OR THE 4TH RING

If you're across town or out of town, why invest a dime or pay for a toll call if you have no messages?

Each time you reset your machine, it will answer the first call on the 4th ring. After it's taken its first message, it automatically starts answering on the second ring. So, when you call in, just hang up if you get to the third ring. You'll automatically know that you have no messages.

If you do have messages, just give the machine a special signal with your own voice, and you'll receive your messages. Then you can have the machine save or erase the messages that you have heard.

## MISSILE GUIDANCE

This machine is so smart that it electronically marks each message's location. It knows precisely where your outgoing announcement as well as each message that has been left is located.

The action is fascinating to watch. First, it plays your outgoing announcement. Then, it sounds a tone as it zips to the end of the last message it took.

It then beeps and starts taking the new message. Finally, it rewinds back to the precise start of your outgoing announcement, prepared to start again.



## MORE SMARTS

If you want to record both sides of a call, just touch the 2-way record button

and you'll have a record of the call.

Everything is automated. Just touch one of the full logic controlled buttons and this computer answers with a confirming beep and jumps into action.

To play back messages at home, just touch the 'Message Report' Button. A flashing message light even tells you at a glance if you've received any messages while you were out.

## EASY INSTALLATION

Just plug in the modular phone jack and the included AC adaptor. Then, just record your announcement.

The Answerer Attack Phone is ready to take messages or act as your super automated office or home telephone. It's made by Unitech and backed by their standard limited warranty.

## THE ANSWERER ATTACK PHONE RISK FREE

It's new. And, it will set you free. From its Phone Company feel handset to its electronic convenience extras to its state of the art answerer, you'll have incredible convenience and simply great sound.

If you're not 100% thrilled, simply return it to DAK within 30 days in its original box for a courteous refund.

To order your Unitech Answerer Attack Phone with totally automated telephone features and easy to use answering machine risk free with your credit card, call toll free or send your check for DAK's breakthrough price of just \$99 plus \$7 P&H. Order No. 4359. CA res add tax.

Wait till you hear the phone. Wait till you use the 1 touch dialing. And, wait till you hear the sound quality and enjoy the convenience of this answering machine.

**DAK**  
INDUSTRIES INCORPORATED

**TOLL-FREE ORDER LINE**  
For credit card orders call 24 hours a day 7 days a week  
**CALL TOLL-FREE. . . 1-800-325-0800**  
8200 Remmet Ave., Canoga Park, CA 91304

**\$99<sup>90</sup> EARTHSHAKER**



# Crooning Titan Plus

*You'll experience melodious but thunderous sound at home or on the road from this bi-amplified audiophile portable with subwoofer, 7-band equalizer and dual high speed dubbing cassette decks.*

It's rich. It's deep. And it's powerful. This portable has the sound and features you'd expect from home stereo.

In fact, when you are at home or at the office, it makes a great second stereo system, with its rich thundering bass and vibrantly alive highs.

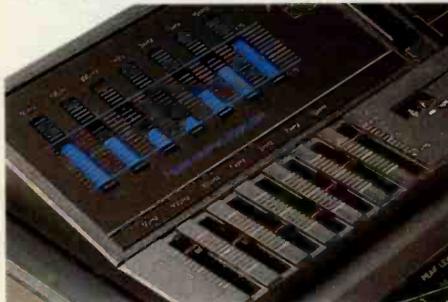
You'll have superb sounding FM stereo, AM and sequentially playing cassettes.

## COLOSSAL SOUND

Forget boom box sound. Now you can have bi-amplified, equalized and enhanced deep bass sound wherever you are.

**The Equalizer.** Most portables have 'Tone' controls or, at best, some have bass and treble controls.

Now you can infuse your bass with life at 50hz for the very low bass and at 100hz for mid-low bass. String basses, drums and orchestral crescendos will literally throb with life.



Cymbals, or brushes on a snare drum, will take on life and excitement as you boost this equalizer's 15,000hz control.

And best of all, you won't make your favorite singer's voice sound raspy when you boost the highs or muddy when you boost the lows, because an equalizer lets you sculpture just the areas of the frequency spectrum you want to enhance.

The 7-band EQ lets you sculpture the sound at 50hz, 100hz, 300hz, 1,000hz, 3,000hz, 7,000 hz and 15,000hz.

**Thundering Subwoofer.** Just switch in the separate electronically crossed-over amplifier & 'super woofers' to add earthshaking depth and fullness.

By separately amplifying (bi-amplifying)

the low bass, and not letting it clip (overload) the left and right channel amplifiers, you can maximize the acoustical detail of your mid-range and high-end sound while you infuse your bass with life.

Because this electronic crossover allows some frequencies as high as 400hz to reach the mid-range amplifiers, it may be pushing credibility to call it a true subwoofer. But, you'll be amazed at the power, punch and tightness of the bass.



## EVEN BIGGER THAN IT LOOKS

The speakers across the front provide a continuous 22½" wall of sound. The woofers in the center don't affect stereo separation, because very low frequencies are totally non-directional.

The outer mid-range speakers produce clean, solid mid-range that will let you enjoy your favorite music without coloration. And outermost, are the powerful piezo tweeters which widen your perception of stereo and produce crystal clear, vibrant highs.

## ALL THE MUSIC

Powerful AM and FM tuners with a large slide rule dial, let you pull in even distant stations. At home or away, you're going to have great reception.

**Dual Cassette Decks.** Now you can copy cassettes at normal or high speed. Now you can listen to one cassette and then another, automatically.

The twin decks in this portable are perfectly matched for great sounding recording and playback.

You can make great sounding recordings from its built-in tuners or from its built-in mike. You can also plug in your own external mikes. You'll also have

One Touch Record, Auto-Stop, Automatic Level Control and a Tape Counter.



And don't forget, these decks play sequentially. Just put tapes in decks 'A' and 'B'. When the first tape is finished, the second tape will automatically begin.

You can operate this portable on AC (cord included), by standard D batteries (not included), or by 12V DC from your car (cord not included). It's made by Unitech and backed by their limited warranty.

**A DUAL CASSETTE CROONING TITAN RISK FREE**

This silver-tongued music maker will amaze you with both its purity and its power. It's perfect for the bedroom, den, office or out in the yard.

If you're not 100% satisfied, simply return it in its original box within 30 days for a courteous refund.

To order Unitech's Crooning Titan Plus Portable with 7-Band Equalizer, Bi-Amplified Subwoofer, and High Speed Dubbing, Sequentially Playing, Dual Cassette Decks, risk free with your credit card, call toll free, or send your check for DAK's earthshaking price of just **\$99<sup>90</sup>** (\$7 P&H). Order No. 4637. CA res add tax.

Why be tied down to one room to listen to your favorite cassettes or radio stations? Now you can have really great sound and high speed dubbing anywhere in your home or in the great outdoors.



**DAK INDUSTRIES INC.**

Call Toll Free For Credit Card Orders Only

24 Hours A Day 7 Days A Week

**1-800-325-0800**

For Toll Free Information, Call 6AM-5PM Monday-Friday PST

Technical Information. . . . 1-800-272-3200

Any Other Inquiries. . . . . 1-800-423-2866

8200 Remmet Ave., Canoga Park, CA 91304

# HEAR WHAT YOU'VE BEEN MISSING!

When you hear the fidelity and accuracy of the AKG K 240DF Studio Monitor Headphones, you'll know why it's become a standard for Digital Compact Disc recording engineers and professional musicians around the world. The K 240DF establishes a uniform sound quality, free from environmental variables and has been created to meet a recently proposed IRT (Institute for Broadcast Technology) international standard. It's so smooth and flat that AKG engineers use the K 240DF as a reference headphone in developing digital products for recording studios.

Each K 240DF is tested in a diffused sound field to arrive at a headphone design with a flat frequency response ( $\pm 2\text{dB}$ ) and match as close to perfection — without coloration or distortion — allowing you to enjoy all the advantages of the latest in CD technology. The self-adjusting headband supports circumaural ear cups. Each contains hand selected, large dynamic moving-coil transducers and acoustic filters yielding the ultimate in Digital CD reproduction. Minimum weight is well distributed for maximum comfort over longtime wear.

The AKG K 240DF Studio Monitor Headphone is a total design concept, just right for you to hear what you've been missing!



77 Select Street  
Stamford, CT 06902

STUDIO MONITOR  
NACH  
IRT  
K 240DF  
2x 600 OHMS  
MADE IN AUSTRIA  
Studio-Monitor

# HOME CD PLAYERS

## ACCUPHASE by MADRIGAL

### DP-80/DC-81 Separate-Type CD Player

CD-playing system consisting of the DP-80 CD player to read digital signals from CDs and the DC-81 digital processor to convert the digital signals the DP-80 reads into audio signals. Separate trans-



Accuphase DP-80/81 CD Player/Processor

port and digital-processing chassis connected by optical fiber. Uses a D/A converter with discrete elements. DP-80 CD player features one master clock to control all operation timing; linear motor laser pickup and 18-bit microprocessor to achieve a <1-sec selection time; player mechanism mounted on ceramic-resin mounting and floated from chassis; front-panel play, track-search, and pause keys; subpanel skip-back, fast-forward, fast-reverse, repeat-disc, and repeat-phrase keys. Cues by track number. Displays current track number. DC-81 digital processor features wideband optical-fiber input receptacles; 16-bit digital signal and deglitch signal for each channel input to D/A converter through 17 optoisolators; 121-stage double oversampling digital filter in each channel; 9-pole GIC-type Butterworth active filters; directly coupled 0-dB gain buffer amp used solely as an output stage; de-emphasis circuit consisting of passive elements and buffer amp; independent power transformer for each digital and analog circuits; fixed- and variable-level audio output; XLR-type balanced output. 75-ohm coaxial-cable terminal allows the DC-81 to be connected to Compact Disc players of other manufacturers. 17.5" W X 5.75" H X 15" D; 33 lbs .....\$7,000

## ACOUSTIC RESEARCH

### CD-04 Compact Disc Player

Drawer-loading CD player with proven 14-bit 4X-oversampling DAC system. Features programming of 99 tracks in any order, 99 tracks in sequential order; skip forward; skip back; fast forward;

fast reverse; time/track selection; repeat track, disc; full-function remote control; one-beam laser; 14-bit digital filtering; dual D/A converter. Oversamples at 176.4 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc. 17" W X 4.33" H X 14.5" D . \$480

## ADC

### 16/2R Compact Disc Player

Slide-drawer-loading CD player with advanced error-processing circuitry for precise tracking. Features programming of 16 tracks in any order; skip forward;

skip back; fast forward; fast reverse; cancel; repeat track, disc, program; full-function remote control; 7-pole (7th-order) analog filtering; 3-beam laser. Cues by track number. Samples at 44.1 kHz. Displays current track number, elapsed time of current track; remaining time on disc; program in memory. 17" W X 3.12" H X 11.75" D; 10 lbs ..... \$370  
16/1. As above without remote control ..... \$330

### CD 100X Compact Disc Player

Drawer-loading CD player with three-beam laser. Features advanced error-processing circuitry; programming of 16 tracks in random order; repeat track, disc, program; skip forward and back. Displays current track, remaining time on disc, elapsed time of the track. 13.5" W X 3.5" H X 11.5" D ..... \$299

## ADCOM

### GCD-300 Compact Disc Player

Drawer-loading CD player. Features three-beam laser; skip forward; skip back; repeat phrase, remote control; displays current track number, elapsed time of current track, elapsed time of disc, program stored in memory. Cues by track number. Max line output 2.5 V; THD at 1,000 Hz 0.004%; sep 80 dB; FR 5-20,000 Hz  $\pm 0.5$  dB ..... \$500

GCD-200. As above without remote control ..... \$450

## ADS

### Atelier CD3 Compact Disc Player

Drawer-loading CD player with separate 16-bit linear D/A converters for each channel and both digital and analog filters. "Computer-on-a-chip" microprocessors provide computing power for tracking-system control, error correction, filtering, and user control input. Error correction system varies the size of correction window in response to actual



ADC 16/2R CD Player

data errors. Entire transport system held in rigid, die-cast chassis for permanent alignment of all system component and is supported by shock mounts to keep acoustic and mechanical vibrations from causing tracking errors. Features 3-beam laser; digital filtering (resampling frequency 88.2 kHz programming of 30 tracks in random order; sound audible during fast forward and fast reverse; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; full-function remote control; headphone jack with adjustable level; fixed and variable outputs; digital interface. Displays current track number, elapsed time of current track, elapsed time of disc, remaining time on disc, program stored in memory. Cues by track number, index number. Max line output 2 V; headphone output 2 V; THD at 20-20,000 Hz <0.01% at -0 dB; S/N >102 dB; sep >86 dB; FR 20-20,000 Hz  $\pm$ 0.25 dB; 20 lbs; 17.5" W  $\times$  2.75" H  $\times$  14.8" D . . . . . \$1,250



*Aiwa DX-1500 CD Player*

repeat track, disc, program; headphone jack with adjustable level; sound audible during fast forward and fast reverse scan. Samples at 44.1 kHz. Displays current track number, elapsed time of current disc, program stored in memory, and remaining time on disc. . . . . \$375

track and index number. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, program in memory. 17.3" W  $\times$  3.1" H  $\times$  10.2" D; 8.6 lbs . . . \$475

#### CD-A3X Compact Disc Player

Drawer-loading CD player with anti-resonant insulated floating mechanism and stabilized servo control system for accurate tracking, gold-plated RCA jacks, disc center support. Features programming of 36 tracks in random and sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; 3-beam laser; 7th-order active analog filtering; single D/A converter; sound audible during fast scan. Cues by track and index number. Samples at 44.1 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, program in memory. 17.3" W  $\times$  3.1" H  $\times$  10.2" D; 7.7 lbs . . . . . \$350

#### CD-M515 Compact Disc Player

Mid-sized-chassis drawer-loading CD player with anti-resonant insulated floating mechanism and stabilized servo control system for accurate tracking and disc center support. Features programming of 36 tracks in random and sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; 3-beam laser; 7th-order active analog filtering; single D/A converter; sound audible during fast scan. Cues by track and index number. Samples at 44.1 kHz. Displays current track number, elapsed time of cur-



*ADS CD3 Compact Disc Player*

#### Atelier CD4 Compact Disc Player

CD player with cast laser and disc transport assembly shock mounted in rubber isolators, aluminum and steel chassis/housing, and multiple power supplies to isolate digital and analog stages for minimum Interaction and noise generation. A servo-laser intensity system switches focus intensity depending on quality of disc to maximize performance. Brick-wall digital filter works in conjunction with advanced multiple-pole low-pass filter. Features error-correcting system using a variable-size window of correction; 16-bit D/A converters; fast-focus 3-beam laser; programming of 16 tracks in random order; repeat disc, track, user-marked phrase, and program; random-access by time within a track; access by index code; audible fast search; 5-function infrared remote control. Displays elapsed time from track start, remaining time to disc end, track/program selection number, index, program in memory . . . \$900

#### AIWA

#### DX-1500 Compact Disc Player

Drawer-loading Compact Disc player with nine-function wireless remote control. Features programming of sixteen tracks in random order; programming of 99 tracks in sequential order; track skip forward; track skip back; audible fast forward and fast reverse; cancel feature;

#### AKAI

#### CD-A70 Compact Disc Player

Drawer-loading CD player with anti-resonant construction including high-polymer cabinet, insulated floating suspension, and support feet for accurate tracking. Dual power supply eliminates mistracking during dynamic sections. Natural-logic programming allows 27-keystroke programming for virtually unlimited number of track programmability. Features gold-plated RCA jacks; subcode terminal; disc center support; stabilized servo control system; Independent left/right monaural amps; skip forward; skip back; fast for-



*Akai CD-A70 Compact Disc Player*

ward; fast reverse; cancel; repeat track, disc, phrase, program; 32-function remote control; 3-beam laser; steep 90-dB attenuation digital filtering; 7th-order active analog filtering; single D/A converter; sound audible during fast scan. Cues by

rent track, elapsed time on disc, program in memory. 13.8" W  $\times$  3.3" H  $\times$  10.2" D \$340

#### CD-A30 Compact Disc Player

Drawer-loading CD player with anti-resonant insulated floating mechanism and

stabilized servo control system for accurate tracking and disc center support. Features programming of 36 tracks in random and sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; 3-beam laser; 7th-order active analog filtering; single D/A converter; sound audible during fast scan. Cues by track and index number. Samples at 44.1 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, program in memory. 17.3" W X 3.1" H X 10.2" D; 7.7 lbs ... \$340

**AUDIOQUEST**

**TCD-10 Compact Disc Player**

Drawer-loading CD player with improved filtering system to reduce phase shift. Analog stage following D/A converter stage employs vacuum tubes. Features random-access programming of 785 tracks in any order; skip forward; skip back; 3-speed fast forward and reverse; 4-sec precord-pause insertion; anti-jamming protection; repeat track, disc, and program; headphone jack with adjustable level; infrared remote control; one-beam laser; dual D/A converters. Cues by track number. Oversamples at 176.4 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc. Includes 4 sorbothane isolation feet \$695

cludes an additional altered output; music scan; single play; and a digital output for CD graphics, CD ROM, etc. Headphone output 0-5 V. 16.5" W X 3.5" H X 11.75" D; 9.75 lbs ..... \$1,495

**CD-1 Compact Disc Player**

Drawer-loading CD player with premium-quality capacitors and mechanical dampening. Features skip forward; skip back; fast forward; fast reverse; repeat disc; headphone jack; dual D/A converters;

**AUDIO-TECHNICA**

**AT-CD20 Compact Disc Player**

Draw-loading CD player with 3-beam laser and programming of 9 tracks in random order. Features full-function wireless remote control; double-resolution digital filtering; 5th-order active filter; repeat disc, phrase, program; track search; index search; dual-speed fast forward and reverse with automatic switching in PLAY or PAUSE modes; CIRC dual-error



Audio Technica AT-CD20 CD Player

sound audible during fast scan. Cues by track number. Oversamples at 176.4 kHz. Displays current track number. Includes 4 sorbothane isolation feet \$695

correction system; dual D/A converters; headphone jack with adjustable level. Displays current track number, elapsed time of current track, and total music

**illinois audio**

SAVE MONEY • TIME • FREIGHT ON NAME BRAND STEREO

**COMPACT DISC PLAYERS**

- JVC XL-V200B 3-BEAM, DIG. FILTERED, PROGRAMMABLE ..... CALL
- SHARP DX-111BK AFFORDABLE CD PLAYER ..... \$159.95
- SHARP DX-620BK PROGRAMMABLE W/REMOTE ..... 199.95
- SONY CDP-35 PROGRAMMABLE ..... 199.95
- SONY CDP-50 PROGRAMMABLE W/REMOTE ..... 249.95
- TEAC PD-400 PROGRAMMABLE W/REMOTE ..... 219.95
- TECHNICS SLP-110 NEW AND PROGRAMMABLE ..... 215.00
- TECHNICS SLP-310 NEW, PROGRAMMABLE W/REMOTE ..... CALL
- TECHNICS SL-P500 TOP OF THE LINE! ..... CALL
- TOSHIBA XR-J9 MIDI-SIZE PROGRAMMABLE ..... 149.95
- TOSHIBA XR-35 PROGRAMMABLE W/REMOTE ..... 199.95
- TOSHIBA XR-V22 DOUBLE CD PLAYER ..... 319.95

**PORTABLE CD PLAYERS**

- PANASONIC RX-CD70 AM-FM, DUBBING CASS. W/DOLBY ..... 449.95
- SHARP WQ-CD15BK AM-FM, CASSETTE ..... 369.95
- SONY D-14 PLAYER ONLY W/AC ADAPT., BATTERY PK. & CASE ..... 159.95
- SONY D-55 ABOVE W/FM, PROGRAMMABLE, & HEADPHONE ..... 249.95
- SONY D-75 WORLD'S SMALLEST, & PROGRAMMABLE ..... 229.95
- SONY CFD-W888 AM-FM DUBBING CASSETTE W/DOLBY ..... 499.95
- TECHNICS SL-XP5 NEW, PROGRAMMABLE W/HEADPHONES ..... CALL
- TECHNICS SL-XP8 ABOVE W/DIGITAL AM-FM ..... 269.95
- TOSHIBA XR-P9 3-BEAM, PROGRAMMABLE W/REMOTE ..... 219.95

**ELECTRONICS**

- SONY STR-AV340 (35X2) AM-FM RECEIVER W/REMOTE ..... 219.95
- TEAC V-450X CASSETTE DECK W/DOLBY B.C. & DBX ..... CALL
- TECHNICS SA-959 (100X2) AM-FM RECEIVER W/EQ. & REMOTE ..... 349.95
- TECHNICS SA-370 (40X2) AM-FM RECEIVER W/REMOTE ..... 199.95
- TECHNICS SU-V60 (90X2) VC-4 CLASS AA INTEGRATED AMP ..... 215.00
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- ADC SS-117EX 10 BD PER CH. W/SPATIAL EXPANDER ..... 149.95
- ADC SS-412X 10 BD PER CH. W/SPEC. ANALYZER ..... 279.95
- AUDIOSOURCE EQ-ONE II 10 BD PER CH. W/ANALYZER ..... 249.95
- AUDIOSOURCE AV-1 10 BD. AUDIO/VIDEO PROCESSOR ..... CALL
- TECHNICS SH-8046K 14 BD W/ANALYZER & 4 PRESETS ..... 169.95
- TEAC EQA-10B 10 BD PER CH. W/ANALYZER ..... 85.00
- TEAC EQA-20B ABOVE W/TAPE DUBBING CAPABILITY ..... 99.00

**SURROUND SOUND DECODERS**

- AUDIOSOURCE SS-1 (15X2) W/DOLBY ..... 199.95
- S.S.I. 360 II WITH DOLBY ..... 219.95
- SANSUI DS-77 (10X2) AUDIO/VIDEO PROCESSOR ..... CALL
- TECHNICS SH-AV44 (25X2) W/DOLBY ..... 179.95

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- SONY MDR-CD-5 MONITOR HEADPHONES ..... 64.95
- KOSS SST-7 NEW, DIGITAL READY ..... 44.95
- KOSS PRO-4X PLUS ONE OF KOSS' MOST POPULAR ..... 51.00
- SENNHEISER HD-414SL OPEN AIR, LIGHT WEIGHT ..... 49.00

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- TDK SA-90 SUPER AVILYN ..... 18.00/10
- TDK HXS-90 HIGH BIAS, METAL PARTICLE ..... 31.00/10
- MAXELL XLII-90 HIGH BIAS ..... 18.00/10
- MAXELL XLII'S-90 HIGH BIAS ..... 24.00/10
- BASF CRE II-90 TRUE CHROMDIOXID TAPE ..... 16.90/10
- FUJI METAL-90 'FR' SERIES TAPE ..... 30.00/10
- SONY UCX-90 HIGH BIAS ..... 15.00/10

**ACCESSORIES**

- ALLSOP CD CLEANER ..... 14.95
- DISCWASHER CD CLEANER ..... 11.95
- PARSEC 7403 II ANTENNA ..... 54.95
- TEAC CD-74 STORAGE CASE ..... 29.95

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time. Sound audible during fast scan. Play-spacing function inserts 3 seconds between selections. Includes stereo output cord, RC20 remote control transmitter, 2 AA batteries. Headphone output 0.16 V. 7 lbs; 17" W x 3.60 H x 11.5" D ..... \$400

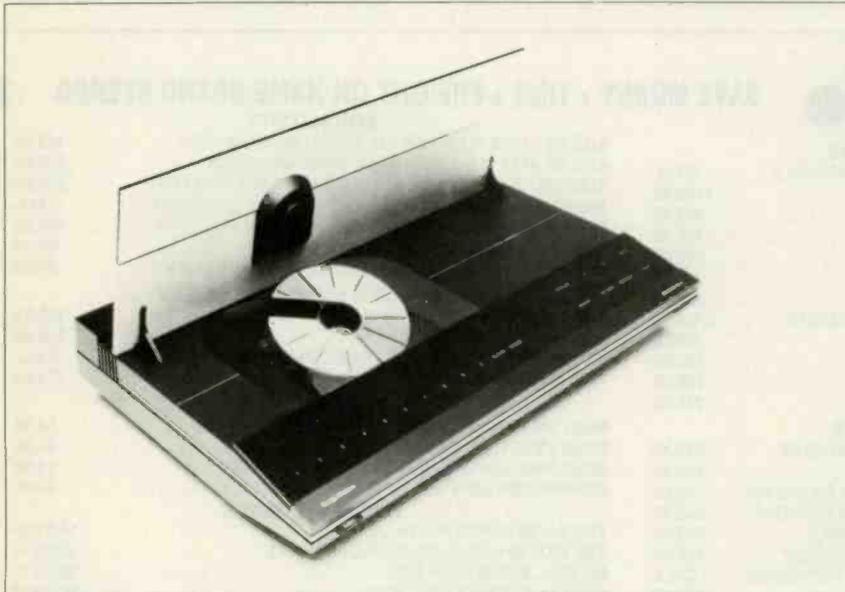
### BANG & OLUFSEN

#### CD50 Compact Disc Player

Drawer-loading CD player. Features three-beam laser; digital filtering (resampling frequency 88.2 kHz) programming of 34 tracks in random order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, program; full-function remote control. Displays current track number, elapsed time of current track, elapsed time of disc, program stored in memory. Cues by track number, index number. Max line output 2 V; THD at 1,000 Hz 0.003% at -0 dB; S/N 95 dB; sep 94 dB; FR 4-20,000 Hz  $\pm 0.3$  dB; 17.7 lbs; 16.5" H x 3" W x 12.75" D ..... \$999  
Optional CD 50 Remote Terminal . \$150

#### CDX Compact Disc Player

Top-loading CD player. Features one-beam laser; digital filtering (resampling frequency kHz 176.4 kHz) programming of 40 tracks in random order; skip forward; skip back; fast forward; fast re-



Bang & Olufsen CDX CD Player

verse; cancel; repeat track, disc, program. Displays current track number, elapsed time of current track, elapsed time of disc, program stored in memory. Cues by track number, time. Max line output 2 V; THD at 1,000 Hz 0.003% at -0 dB; S/N 96 dB; sep 94 dB; FR 3-20,000 Hz  $\pm 0.3$  dB; 13.4 lbs; 16.5" W x 3" H x 12.25" D ..... \$699

### CAMBRIDGE AUDIO

#### CD1 Compact Disc Player

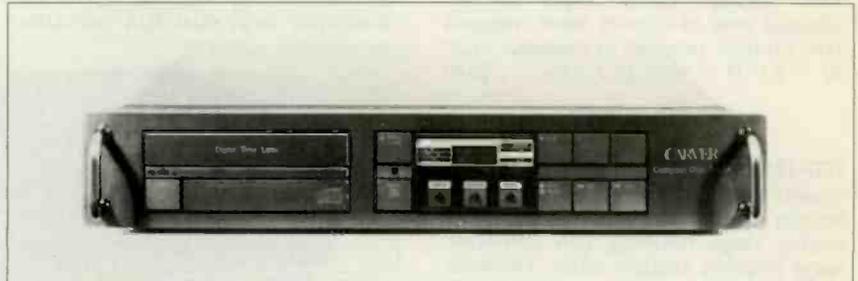
Features 2 chassis (1 for decoders and other for playing mechanism); 3 separate power supplies; three separate 16-bit

decoders/ch; 19-bit resolution yield; 6 analog filters; D/A converters; isolated CD tray; solid wood end panels. 17.5" W x 5" H x 11" D; 20 lbs ..... \$2,495

### CARVER

#### DTL-200 Compact Disc Player

Drawer-loading CD player with 3-beam laser and Digital Time Lens circuitry to correct sonic problems in source materi-



Carver Digital Time Lens Compact Disc Player

al. Features 18-bit linear-phase digital filter for vertical elimination of sampling distortions through a 726 dB/octave rolloff; programming of 9 tracks in any order; programming of 99 tracks in sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, and program; 24-function remote control; 121st-order lin-

current track, elapsed time of disc, program stored in memory; sound audible during fast forward and fast reverse; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; cue by track number, index number. Maximum line output 1.9 V; total harmonic distortion at 1,000 Hz 0.05%; signal-to-noise ratio 96 dB; separation 86 dB; frequency response 5-20,000 Hz; 13 lbs; 19" W x 3.44" H x 11.25" D \$650

#### DTL-50 Compact Disc Player

Drawer-loading CD player with 3-beam laser and Digital Time Lens circuitry to correct sonic problems in source material. Features programming of 9 tracks in any order; programming of 99 tracks in sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, and program; 12-function remote control; 88.2 kHz double digital filtering; dual D/A converters. Cues by track and index number. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc, program in memory. Sound audible during fast forward and reverse. 17" W x 3" H x 11.25" D; 10 lbs ..... \$549

### dbx

#### DX3 Compact Disc Player

Drawer-loading CD player. Features three-beam laser; digital filtering (resampling frequency 88.2 kHz); programming of 9 tracks in random order; sound audible during fast forward and fast reverse; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, program. Displays current track number, elapsed time of current track. Cues by track number, index number. Equipped with 3 dbx signal-processing circuits: DAIR- a 2-band design for adding impact to musical transients, compression control for background listening (has fixed threshold with variable gain below threshold and professional OverEasy compression with variable ratio above threshold), ambiance control to add or

ear-phase digital filtering (F.I.R. @ 88.2 kHz); dual D/A converters. Cues by track and index number. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc, program in memory. Sound audible during fast forward and reverse. 19" W x 3.44" H x 11.25" D; 13 lbs ..... \$699

#### Digital Time Lens Compact Disc Player

Drawer-loading CD player. Features three-beam laser; digital filtering (resampling frequency 88.2 kHz); programming of 9 tracks in random order; display of current track number, elapsed time of

These listings are based on data provided by the manufacturers. For more product information, contact an authorized dealer or the manufacturer directly. Manufacturers' addresses are given in the directory beginning on page 147.

subtract left-right (out-of-phase) information in the midrange and treble fields increasing or decreasing spaciousness of the entire sound field. Maximum line output 2 volts; total harmonic distortion <0.002% from 20-20,000 Hertz, total harmonic distortion less than 0.07% with dbx

## DENON

All Denon CD players feature Direct Digital to Analog Converters (DDAC) to virtually eliminate distortion in digital-to-analog conversion process.



dbx DX3 Compact Disc Player

processing; S/N ratio 90 dB below 1 V A-wtd, 96 dB below 2 V A-wtd, 100 dB with player in use, with dbx same as without processing except full compression limits max dynamic range to 60 dB while full DAIR increases dynamic range 10 dB to 106 dB; sep 90 dB; FR 10-20,000 Hz +0.5 dB, -1 dB; 10 lbs; 17.12" W x 3.69" H x 11.44" D ..... \$599

## DCD-1500 Compact Disc Player

Drawer-loading CD player. Features 3-beam laser; digital filtering (resampling frequency 88.2 kHz); programming of 20 tracks in any order; sound audible during fast scan; skip forward; skip back; fast forward/reverse; cancel; repeat track, disc, phrase, program; 10-function remote control; headphone jack with ad-

justable level. Displays current track number, elapsed time of current track, elapsed time of disc, remaining time on disc, program stored in memory. Cues by track number, index number, time. total harmonic distortion at 1,000 Hz 0.0025%; signal-to-noise ratio 96 dB; separation 95 dB; frequency response 5-20,000 Hz  $\pm$  0.3 dB ..... \$650

## DCD-1300 Compact Disc Player

Features real-time super-linear digital-to-analog converter; 20-random-preset programming; headphone jack with adjustable volume control; analog and digital filtering; call selector; repeat selector; index search ..... \$550

## DCD-700 Compact Disc Player

Features super-linear D/A converter; wireless remote control; analog filtering; headphone jack with adjustable volume control ..... \$400

## DCD-500 Compact Disc Player

Features super-linear D/A converter; 15 random presets; analog filtering; headphone jack ..... \$330

## Accessories

ACA-52. Side panels for DCD-1300/1500 ..... \$30

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Charlie Derek, Station KRAV-FM.

With one of the largest compact disc collections in the country, Radio Station KRAV knows it has to clean CDs because it can't afford playback tracking problems. And a dirty compact disc will distort the sound by blocking or scattering the CD player's laser beam.

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CIRCLE NO. 9 ON READER SERVICE CARD

## DISCRETE TECHNOLOGY

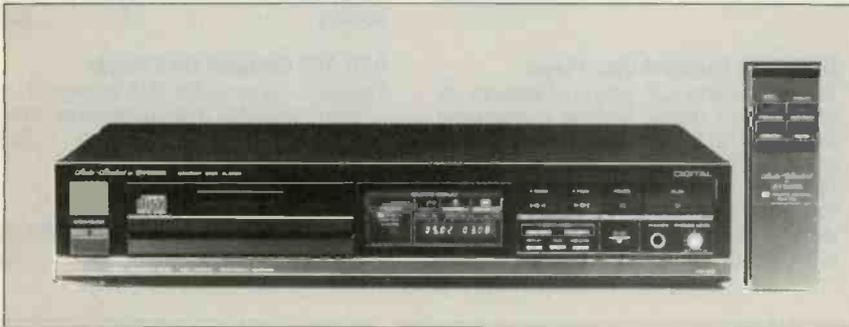
## LSI MKII Compact Disc Player

Drawer-loading CD player with one set of variable and one set of fixed outputs that can connect directly to a power amp. Features skip forward; skip back; fast forward; fast reverse; repeat track, disc, program; one-beam laser; digital filtering; analog filtering; dual D/A converters. Cues by index number. Oversamples at 176.4 Hz. Displays current track number, elapsed time of current track. 16.5" W × 3.5" H × 11.88" D; 16.5 lbs . . . \$1,195

## FISHER

## AD-815B Compact Disc Player

Features 6-function wireless infrared remote control; 8-selection programmable scan function; horizontal-load system



Fisher AD-815B CD Player

with motorized drawer; skip forward and reverse; ALL/ONE/OFF repeat function with LED indicator; digital display of track and index numbers; index search. 440 mm W . . . . . \$400

## AD-924B Compact Disc Player

Features 16-selection programmable scan function; horizontal-load system with motorized drawer; skip forward and reverse; ALL/ONE/OFF repeat function with LED indicator; digital display of track and index numbers; index search. 440 mm W . . . . . \$380

AD-922B. As above except 400 mm W . . . . . \$380

## GENERAL ELECTRIC

## 11-4911 Compact Disc Player

Drawer-loading CD player with infrared remote control. Features 3-beam laser;



General Electric 11-4911 CD Player

programming of 15 tracks in any order; repeat program, disc, phrase; forward and reverse skip search; forward and reverse index search; audible fast forward and reverse music search; timer playback function. Displays track number, index number, elapsed time. Lighted symbols/words indicate program, repeat, A-B repeat, play, pause. 10-key front-panel number pad. 17.12" × 2.88" × 10.44"; 9.5 lbs . . . . . \$270

## 11-4800 Compact Disc Player

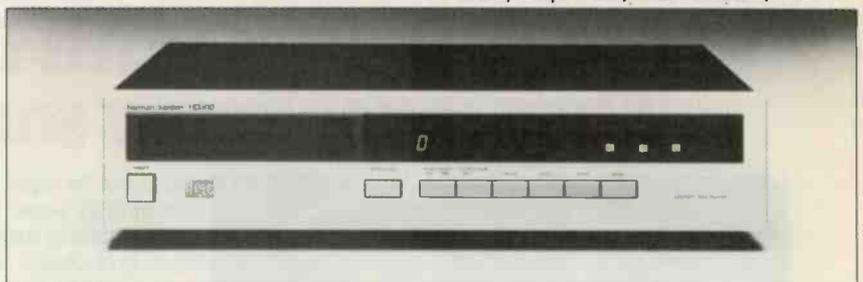
Drawer-loading CD player. Features 3-beam laser; programming of 15 tracks in any order; repeat program, disc, phrase; forward and reverse skip search; forward and reverse index search; 2-speed audible fast forward and reverse music search; timer playback function. Displays track number, index number, elapsed

time. Lighted symbols/words indicate program, repeat, A-B repeat, play, pause. 17.12" × 2.88" × 10.44"; 9.5 lbs . . \$230

## HARMAN KARDON

## HD300 Compact Disc Player

Drawer-loading CD player with zero-



Harman Kardon HD300 Compact Disc Player

feedback, all-discrete analog stage to ensure very low IM distortion from DC-100,000 Hz eliminating "alias error" and allowing the use of very shallow analog filter after D/A converter to preserve spatial information. Features programming of 15 tracks in any order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase and program; cueing by track number; 3-beam laser; single D/A converter; 16-bit linear-conversion digital filtering with dual sample; all discrete, gradual slope analog filtering. Oversamples at 88.2 kHz. Displays current track number. 17.36" W × 4" H × 13.25" D; 12.8 lbs . . . . . \$575

## HITACHI

## DA005 Compact Disc Player

Drawer-loading CD player with direct PIT servo, 5-stage error correction, 121-band digital filter. Programs 15 tracks in any order. Features skip forward; skip back; fast forward; fast reverse; cancel; repeat track; repeat disc; repeat phrase; repeat program; cues by track; 28-function remote; headphone jack; adjustable headphone; three-beam laser; single D/A converter; display of current track number; display of elapsed time of current track; display of remaining time on disc; sound audible during fast scan. Headphone output 2 V; 11 lbs . . . . . \$800

## DA501 Compact Disc Player

Drawer-loading CD player with 4-way repeat and direct Pit servo. Programs 15 tracks in any order. Features skip forward; skip back; fast forward; fast re-

verse; timer play; repeat track; repeat disc; repeat phrase; repeat program; cue by track; 18-function remote; headphone jack; adjustable headphone; three-beam laser; analog filtering; single D/A converter; display of current track number; display of elapsed time of current track. Headphone output 2 V; 10 lbs . . . \$600

## DA6001 Compact Disc Player

Drawer-loading CD player with direct Pit servo, new floating mechanism, 6-digit FL display and 4-way repeat. Programs 15 tracks in any order. Features skip forward; skip back; fast forward; fast reverse; timer play; repeat track; repeat disc; repeat phrase; repeat program; cue by track; 6-function remote; three-beam laser; single D/A converter; display of current track number; display of elapsed time of current track; sound audible during fast scan . . . . . \$450

**DA500 Compact Disc Player**

Drawer-loading CD player. Features three-beam laser; programming of 15 tracks in random order; display of current track number, elapsed time of current track; program stored in memory; sound audible during fast forward and fast reverse; skip forward; skip back; fast forward; fast reverse; repeat track, disc, phrase, program; cue by track number, Index number. Max line output 2.5 V; total harmonic distortion at 1,000 Hz 0.003%; IMD 0.003%; signal-to-noise ratio 95 dB; separation 92 dB; frequency response 5-20,000 Hz. 17.12" W x 3.25" H x 10.36" D ..... \$450

**DA600 Compact Disc Player**

Drawer-loading CD player with 4-way repeat and 6-digit FL display; direct Pit servo; new floating mechanism. Programs 15 tracks in any order. Features skip forward; skip back; fast forward; fast reverse; timer play; repeat track; repeat disc; repeat phrase; repeat program; cue by track; three-beam laser; analog filtering; single digital-to-analog converter; display of current track number; display of elapsed time of current track; sound audible during fast forward and fast reverse ..... \$400

**JVC****XL-V100BK Compact Disc Player**

Drawer-loading CD player with high-precision 3-beam laser pickup design for high sensitivity and low resonance and vibration, separate digital and analog circuits for improved isolation and lower noise; Independent Suspension System (ISS) and large insulators to protect the pickup and disc from vibration and resonance; 2 outputs (fixed and variable). Remote controllable with selected JVC Compu-Link Components. Features programming of 15 tracks in any order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, and program; 30-function remote control; headphone jack with adjustable level; higher-filter digital filtering; analog filtering; dual D/A converters; sound audible during fast scans. Cues by track number, index number, and time. Oversamples at 176.4 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc, program in memory. Headphone output 2 V. 17.19" W x 3.94" H x 15.88" D; 17.7 lbs ..... \$1,000

**XL-V440BK Compact Disc Player**

Drawer-loading CD player with high-precision 3-beam laser pickup design for high sensitivity and low resonance and vibration, Independent Suspension System (ISS) to protect the pickup and disc from vibration and resonance; 10-key direct access and programming; New Y Servo System with High-Balance Servo and High-Trackability Servo for unerring tracking of any disc. Remote controllable with selected JVC Compu-Link Components. Features programming of 15 tracks in any order; skip forward; skip back; fast forward; fast reverse; repeat

disc, and program; 23-function remote control; 3-beam laser; headphone jack with adjustable level; digital filtering; single D/A converter. Cues by track number and time. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track. Headphone output 2 V. 17.19" W x 3.31" H x 11.36" D; 7.3 lbs ..... \$400

**XL-V330BK Compact Disc Player**

Drawer-loading CD player with high-precision 3-beam laser pickup design for high sensitivity and low resonance and

vibration, Independent Suspension System (ISS) to protect the pickup and disc from vibration and resonance; direct access programming; New Y Servo System with High-Balance Servo and High-Trackability Servo for unerring tracking of any disc. Remote controllable with selected JVC Compu-Link Components. Features programming of 15 tracks in any order; skip forward; skip back; fast forward; fast reverse; repeat disc, and program; 23-function remote control; 3-beam laser; headphone jack with adjustable level; digital filtering; single D/A con-

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verter. Cues by track number and time. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track. Headphone output 2 V. 17.19" W X 3.31" H X 11.36" D; 7.3 lbs. \$350

#### XL-V220BK Compact Disc Player

Drawer-loading CD player with high-precision 3-beam laser pickup design for high sensitivity and low resonance and vibration, Independent Suspension System (ISS) to protect the pickup and disc from vibration and resonance; New Y Servo System with High-Balance Servo and High-Trackability Servo for unerring tracking of any disc. Remote controllable with selected JVC Compu-Link Components. Features programming of 15 tracks in any order; skip forward; skip back; fast forward; fast reverse; repeat disc, and program; headphone jack with adjustable level; digital filtering; single D/A converter. Cues by track number and time. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track. Headphone output 2 V. 17.19" W X 3.31" H X 11.36" D .. \$275

#### KENWOOD

#### DP-1000 IIB Basic Series CD Player

Drawer-loading CD player displays elapsed time of current track, remaining time on disc, and program in memory. Features programming of 16 tracks in any order; skip forward; skip back; repeat track, disc, and program; cue by index number; 24-function wireless remote control; linear-skate disc loading; 16-bit linear quantizing per channel; semiconductor laser; audible FF and FR. Space function provides 4 seconds between selections. W&F below measurable limit; dynamic range 95 dB; constant linear velocity 1.2-1.4 m/sec; sampling frequency 44,100 Hz; max line output 2.0 V; headphone output 31 mW/32 ohms; THD <0.0015% at 1,000 Hz; FR 20-20,000 Hz  $\pm 0.5$  dB; 15 lbs; 15.31" W x 3.16" H x 12.22" D ..... \$510

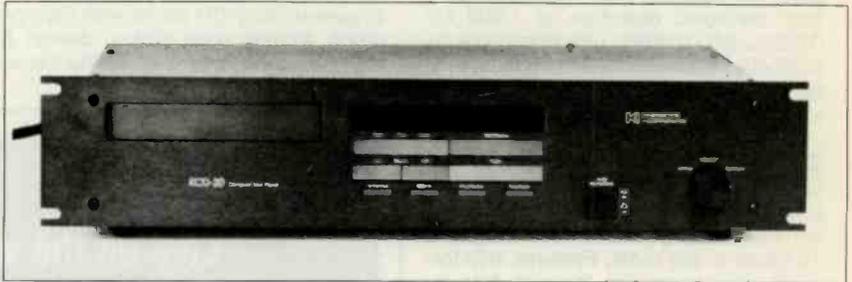
#### DP-850(B) Compact Disc Player

Drawer-loading CD player displays elapsed time and remaining time on disc. Features laser with servo control; repeat disc and program; cue by track and index number; headphone jack with adjustable level; linear-skate disc loading; index and track search; memory function; 16 bits linear quantizing per channel; timer play. W&F below measurable limit; max line output 2.0 V; headphone output 25 mW/32 ohms; THD less than 0.003% at 1,000 Hz; separation 90 dB at 1,000 Hz; frequency response 5-20,000 Hz  $\pm 0.5$  dB; 10.5 lbs; 16.22" W x 3.31" H x 12.16" D ..... \$315

#### KINERGETICS

#### KCD-20 Gold Series CD Player

Compact Disc player with high-output voltage for directly driving a power amp. Line stage with increased gain and front-panel volume and balance controls eliminate need for preamplifier. Features coil-spring suspension transport and all-metal chassis and cabinet for better



Kinergetics KCD-20 Compact Disc Player

isolation from hum and mechanical problems; dynamic and analog processing circuits; remote power supply; dual D/A converters; single-beam laser with quadruple oversampling; full-function display; indexing; CIRC error-correction system. Black anodized panels with soft-gold lettering. 19" rack mount. 19" W X 3.75" H X 10.62" D; 14 lbs ..... \$795  
Optional remote control approx. . . \$100

#### KYOCERA

#### DA-910 Compact Disc Player

Compact Disc player with motorized drawer and Ceramic Compound Resin (CCR) chassis. Features 1-beam laser; 4-times digital filtering oversample; programming of 24 tracks in random order; display of current track number, elapsed time of current track, remaining time on disc, program stored in memory; skip forward; skip back; cancel; repeat track, disc, phrase, program; cue by track number, index number; 8-function remote control; headphone jack with adjustable volume; direct-coupled DC-servo amplifier; solid ferrite power transformer to cut eddy current, minimize flux leakage, and improve voltage regulation; die-cast zinc pickup mechanism to isolate unwanted vibrations; automatic gain control in optical servo mechanism; 3-step output level switch for direct connection to a power amp. D/A converter system uses newly developed digital circuits, 3rd-order Bessel filters, and independent left/right D/A converter circuits. Analog circuits vulnerable to external and internal vibrations are encompassed in a Fine Ceramic Linear (FCL) module that suppresses unwanted vibrations. Independent power

circuits for both the digital and analog circuits in the power stage prevent digital noise from leaking over to analog circuits. Hand-held remote transmitter uses a pulse-modulated infrared beam system and duplicates all basic push-button controls of player. Maximum line output 5 volts; total harmonic distortion at 1,000 Hertz 0.005%; signal-to-noise ratio 95 dB; separation 90 dB; frequency response rated at 5-20,000 Hertz  $\pm 0.5$

dB; 22 lbs ..... \$1,600

#### DA-810 Compact Disc Player

Compact Disc player with motorized drawer. Features 1-beam laser; digital filtering oversample; programming of up to 24 tracks in random order; display of current track number, elapsed time of current track, remaining time on disc, program stored in memory; skip forward; skip back; cancel; repeat disc, phrase, program; cue by track number, index number; headphone jack (adjustable output). Maximum line output 4 volts; total harmonic distortion at 1,000 Hertz 0.005%; signal-to-noise ratio 95 dB; separation 90 dB; FR 20-20,000 Hz  $\pm 0.5$  dB; 18.12" W x 4.5" H x 12.62" D .. \$1,100

#### DA-710CX Compact Disc Player

Drawer-loading Compact Disc player with ceramic guides for laser head mechanism. Features programming of up to 24 tracks in random order; programming of up to 99 tracks in sequential order; skip track forward; skip track back; fast forward; fast reverse; cancel; repeat track; repeat disc; repeat phrase; repeat program; 39-function remote control; headphone jack with adjustable volume control; digital-filtering oversampling; third-order analog filtering; dual digital-to-analog converters; sound audible during fast forward and fast reverse. Cues by track number; cues by index number. Displays current track number, remaining time on disc, and program in memory. Headphone output 50 mW. 18.12" W X 3.56" H X 12.12" D; 13 lbs . . . \$750

#### DA-610CX Compact Disc Player

Drawer-loading Compact Disc player with three-beam laser and four Fine Ceramics spacers located in the chassis to isolate the laser from any external vibrations. A Zirconia-ceramic guide shaft provides smoother travel of the laser transport for better tracking stability. Included 24-key wireless hand-held remote control can be used in a system remote or separately. Features skip track forward; skip track back; fast forward access; fast reverse access; cancel;

## PRICES LISTED

are only the manufacturers' suggested retail prices  
(also referred to as *list* prices):  
actual selling prices are set by each dealer.  
All prices are subject to change without notice.



Kyocera DA-610CX CD Player

repeat track, disc, and program; programming of 15 tracks in any order, 99 tracks in sequential order; headphone jack with adjustable level; 9th-order analog filtering; single D/A converter; sound audible during fast scans. Displays current track number, remaining time on disc, and program in memory. 18.12" W X 3.56" H X 12.12" D; 11.11 lbs . \$550

#### DA-610 Compact Disc Player

Drawer-loading CD player. Features 3-beam digital filtering; programming of 16 tracks in random order; skip forward; skip back; fast forward; fast reverse; repeat track, disc, program; 8-function remote control; headphone jack with adjustable level; auto shut-off at end of play; remote independently or through remote system center; 16-bit quantization; 9th order analog pass filter. Displays current track number, elapsed time of current track. Max line output 2 V; headphone output 40 mW; THD at 1,000 Hz 0.005%; S/N 90 dB; sep 90 dB; FR 5-20,000 Hz  $\pm 0.5$  dB . . . . . \$550

**RC-101 Remote Control Unit.** Wireless remote control center for selection/function control of Kyocera remote control products. Features single-cable interconnect to units; 2 external remote sensor inputs; manual override . . . \$200

**RS-103 Remote Control Sensor.** Features single-cable connection to Kyocera RC-101 control center and external remote control sensor. Allows multi-room remote control of Kyocera remote-capable CD players, receivers, and cassette decks . . . . . \$75

**RT-102 Remote Transmitter.** Handheld wireless remote transmitter with 12 receiver, 6 tape deck, and 5 CD player functions. Features auto system power on/off. Controls main functions on Kyocera's remote control components directly or by remote sensors . . . . . \$50

#### LUXMAN

#### D-03 Compact Disc Player

Drawer-loading CD player. Features one-beam laser; programming of 20 tracks in random order; skip forward; skip back;

fast forward; fast reverse; cancel; repeat track, disc, program; 7-function remote control. Displays current track number, elapsed time of current track, elapsed time of disc, remaining time on disc, program stored in memory. Cues by track number, Index number, time. Max line output 2 V; THD at 1,000 Hz 0.003% at  $-1$  dB; S/N 97 dB; FR 5-20,000 Hz  $-0.5$  dB; 18.7 lbs; 17.81" W X 3.31" H X 12.94" D . . . . . \$1,500

#### D-404 Compact Disc Player

Drawer-loading CD player. Features one-beam laser; programming of 8 tracks in random order; skip forward; skip back; fast forward; fast reverse; repeat track, disc, program; 5-function remote control; headphone jack with adjustable level. Displays current track number, elapsed time of current track, remaining time on disc, program stored in memory. Cues by track number. Max line output 2 V; THD at 1,000 Hz 0.003% at  $-1$  dB; S/N 96 dB; sep 90 dB; FR 5-20,000 Hz  $-0.5$  dB; 13.2 lbs; 17.81" W X 3.31" H X 12.36" D . . . . . \$580

#### D-100 Compact Disc Player

Drawer-loading CD player with STAR circuitry. Features programming of 15 tracks in any order; skip forward; skip back; fast forward; fast reverse; cancel; repeat disc, program; 10-function infrared remote control; 3-beam laser; mirror-image/phase-coherent anti-aliasing analog filtering; single D/A converter. Cues by track number. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc, program in memory. 17.25" W X 3.36" H X 12.31" D; 9.7 lbs . . . . . \$480

#### MAGNAVOX

#### CDB650 Compact Disc Player

Drawer-loading CD player with Favorite Track Selection (FTS) to allow user to program favorite tracks from a CD library. Includes an additional altered output; music scan; single play; and a digital output for CD graphics, CD rom, etc. Features random access programming

of 785 tracks in any order; skip forward; skip back; 3-speed fast forward and reverse; 4-sec precord-pause insertion; anti-jamming protection; repeat track, disc, and program; headphone jack with adjustable level; infrared remote control; one-beam laser; low-order analog low-pass digital filtering; high-order analog filter with phase and amplitude characteristics; dual D/A converters. Cues by track number. Oversamples at 176.4 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc. Headphone output 0-5 V. 16.5" W X 3.5" H X 11.75" D; 9.75 lbs . . . . . \$430

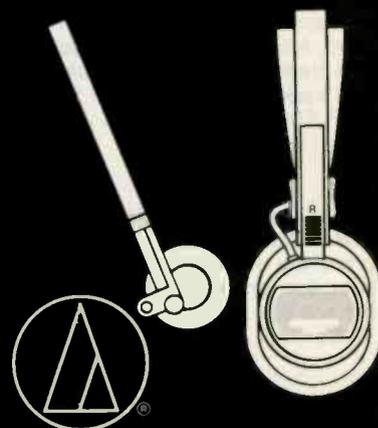
#### CDB560 Compact Disc Player

Drawer-loading CD player with 16-bit digital-to-analog converter and 8-function infrared remote control. Features programming of 20 tracks in any order; skip forward; skip back; fast forward; fast reverse; repeat track, disc; dual D/A converters. Oversamples at 176.4 kHz. Displays current track number, elapsed time of current track, 16.5" W X 3.5" H X 11.75" D; 9 lbs . . . . . \$330

#### FD2041 SL Compact Disc Player

Tray-loading CD player. Features digital filtering (resampling frequency 176.4 kHz); programming of 20 tracks in random order; sound audible during fast

The  
last word  
in  
stereo-  
phones



audio-technica®

CIRCLE NO. 28 ON READER SERVICE CARD

scans; skip forward; skip back; fast forward; fast reverse; cancel; repeat track; 10-function remote control (optional). Displays current track number, elapsed time of current track, time on disc, program stored in memory. Cues by track number. Max line output 2 V; THD at 1,000 Hz 0.003% at -0 dB; IMD 86 dB below 0-dB level; S/N 96 dB; sep 94 dB; FR 20-20,000 Hz  $\pm 0.15$  dB. 16.5" W  $\times$  3.5" H  $\times$  11.75" D ..... \$299

#### FD1051 BK Compact Disc Player

Drawer-loading CD player with digital output for CD-ROM or digital sound processing. Features digital filtering (resampling frequency 176.4 kHz); programming of 20 tracks in random order; skip



Magnavox FD1051 BK CD Player

forward; skip back; fast forward; fast reverse; 8-function remote control. Displays current track number, elapsed time of current track. 12.5" W  $\times$  3.5" H  $\times$  11.75" D ..... \$290

#### CDB460 Compact Disc Player

Drawer-loading CD player with 16-bit dual D/A converters. Features programming of 20 tracks in any order; skip forward; skip back; fast forward; fast reverse. Oversamples at 176.4 kHz. Displays current track number, elapsed time of current track. 16.5" W  $\times$  3.5" H  $\times$  11.75" D; 10 lbs ..... \$250

#### FD1041 BK Compact Disc Player

Drawer-loading CD player. Features digital filtering (resampling frequency 176.4 kHz); programming of 20 tracks in random order; sound audible during fast scans; skip forward; skip back; fast forward; fast reverse; cancel. Displays current track number, elapsed time of current track, time on disc. 12.5" W  $\times$  3.5" H  $\times$  11.75" D ..... \$240

MAN

#### MCD-1 Compact Disc Player

Drawer-loading CD player features programming of 29 tracks in any order; repeat disc, program. Cues by track number and time. 19.5" W  $\times$  3" H  $\times$  12.5" D; 12 lbs ..... \$1,490

MARANTZ

#### CD-74 Compact Disc Player

Drawer-loading CD player. Features one-beam laser; digital filtering (resampling frequency 176.4 kHz) programming of 24 tracks in random order; delete-selection

programming; display of current track number, elapsed time of current, program stored in memory; sound audible during fast forward and fast reverse; skip forward; skip back; fast forward; fast reverse; repeat track, disc, phrase, program; twin D/A converters; synchronized recording. Cues by track number. Max line output 2 V; THD at 1,000 Hz 0.005%; S/N 96 dB; sep 90 dB; 14.3 lbs; 16.5" W  $\times$  4.62" H  $\times$  13.12" D ..... \$650

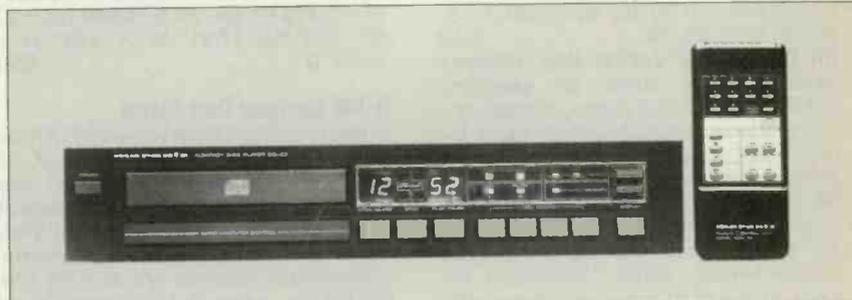
#### CD-152 Compact Disc Player

Drawer-loading CD player. Features 3-beam laser; digital filtering (resampling frequency 176.4 kHz) programming of 16 tracks in random order; display of current track number, elapsed time of cur-

rent track, program stored in memory; sound audible during fast forward and fast reverse; skip forward; skip back; fast forward; fast reverse; repeat track, disc, phrase, program; cue by track number. Max line output 2 V; THD at 1,000 Hz 0.005%; S/N 96 dB; sep 90 dB; 9.5 lbs; 16.2" W  $\times$  4" H  $\times$  11.62" D ... \$330

#### CD-30 Compact Disc Player

Drawer-loading CD player with 3-beam laser. Features programming of 16 tracks in any order; skip forward; skip back; fast forward; fast reverse; repeat



Marantz CD50 Compact Disc Player

track and disc; digital filtering; dual D/A converters. Cues by track number. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track, remaining time on disc. 16.5" W  $\times$  3" H  $\times$  10.88" D; 7.7 lbs ... \$330  
**CD 50.** Same as CD 30 with wireless infrared remote control ..... \$400

MERIDIAN by MADRIGAL

#### 207 Professional Compact Disc Player

Drawer-loading 2-piece CD player with additional inputs and switching for tuner

and tape. Remote control of volume. Can operate as a preamp. Features programming of 99 tracks in any order; skip forward; skip back; fast forward; fast reverse; repeat track, disc, and program; full-function remote control; one-beam laser; dual D/A converters; sound audible during fast scan. Cues by track and index number. Oversamples at 144 kHz. Displays current track number, elapsed time of current track, program in memory ..... \$1,500

#### MISSION ELECTRONICS

#### DAD7000R Compact Disc Player

Drawer-loading CD player with infrared remote control. Features one-beam laser; programming of 20 tracks in random order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, program; Displays current track number, elapsed time of current track. Cues by track number, index number. Max line output 2 V; THD at 1,000 Hz 0.004% at -0 dB; IMD  $< -86$  dB; sep 90 dB; FR 20-20,000 Hz  $\pm 0.3$  dB; 15 lbs; 13" W  $\times$  3" H  $\times$  11" D ..... \$749

#### PCM 7000 Remote Control CD Player

Drawer-loading CD player with twin DAC single chip and fully interactive electronic display. Programs 20 tracks in any order. Features skip forward; skip back; fast forward; fast reverse; cancel; repeat track; repeat disc; repeat phrase; repeat program; cue by track; cue by time; full-function remote; headphone jack; adjustable headphone output; one-beam laser; oversamples at 176.4 kHz; twin DAC single chip VLSI digital filtering; post DAC analog filtering; dual D/A converter; display of current track number; display of elapsed time of current track; display of elapsed time on disc; display of remaining time on disc; display of program in memory. 17" W  $\times$  3" H  $\times$  13.5" D ..... \$699

**PCM 7000R.** Similar to the PCM 7000 with massive transformer in analog section, optimized grounding, and four separate regulated power supplies ... \$899

MITSUBISHI

#### DP-209R Compact Disc Player

Drawer-loading CD player with 3-beam tracking system. Features programming of 36 tracks in any order; skip forward; skip back; fast forward; fast reverse; repeat track, disc, and program; headphone jack with adjustable level; wireless

remote control; analog filtering; single D/A converter; sound audible during fast scans. Cues by track and index number. Displays current track number, elapsed time of current track. 16.81" W × 2.5" H × 11" D; 7.26 lbs ..... \$330  
**DP-109.** Similar to DP-209R except no remote control or adjustable headphone jack ..... \$280

### NAD

#### 5355 Compact Disc Player

Drawer-loading Compact Disc player. Features three-beam laser; display of current track number, elapsed time in track, remaining time on disc; sound audible during fast forward and fast reverse; skip forward; skip back; repeat disc; fast forward; fast reverse; repeat disc; program; cue by track number, display of program in memory; 9-function remote. Max line output 2.0 V; THD at 1,000 Hz 0.003% at 0 dB; S/N 98 dB de-emphasis on; sep 90 dB at 1,000 Hz; FR 5-20,000 Hz ± 0.5 dB ..... \$498

#### 5330 Compact Disc Player

Drawer-loading CD player. Features skip forward; skip back; fast forward; fast reverse; repeat disc; 3-beam laser; 3-pole analog filter; sound audible during fast scan. Cues by track number. Samples at 44.1 kHz. Displays current track, elapsed time of current track, remaining time on disc. 16.5" W × 3.3" H × 12.2" D ..... \$348

### NEC

#### CO-705 Compact Disc Player

Drawer-loading Compact Disc player. Features one-beam laser; digital filtering (resampling frequency 88.2 kHz); nondelay digital filter with 5-pole active low pass; programming of 15 tracks in random/sequential order; display of current track number, elapsed time of current track, elapsed time of disc, remaining time on disc, program stored in memory; sound audible during fast forward and fast reverse; skip forward; skip back; cancel; repeat track, disc, repeat program; cue by track number, index number, time; dockable full-function remote control; max line output 2.5 V; headphone output 1.5 V; THD at 1,000 Hz 0.005%, at 5-20,000 Hz 0.01%; IMD 0.01%; S/N 95 dB at 1,000 Hz; sep 70 dB at 5-20,000 Hz, 90 dB at 1,000 Hz; FR 5-20,000 Hz ± 0.5 dB; 23 lbs; 16.94" W × 42.09" H × 14.19" D ..... \$749

#### CD-607 Compact Disc Player

Drawer-loading CD player. Features three-beam laser; digital filtering (resampling frequency 88.2 kHz); programming of 15 tracks in random/sequential order; sound audible during fast forward and fast reverse; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, program; remote control; 5-pole active low pass filter; high-speed CMOS D/A switching circuit. Displays current track number, elapsed time of current track, elapsed time of disc, remaining time on disc, program stored in

memory. Cues by track number. Max line output 2.5 V; THD at 1,000 Hz 0.005%; S/N 95 dB; sep 90 dB at 1,000 Hz; FR 5-20,000 Hz ± 0.5 dB; 14.77 lbs; 16.28" W × 3.22" H ..... \$599

#### CD-650E Compact Disc Player

Drawer-loading Compact Disc player with nondelay 16-bit digital filter, dual D/A converters, variable and fixed output levels, 99 accessible number of tracks. Features programming of 15 tracks in any order; skip forward; skip back; fast forward; fast reverse; repeat disc, phrase, program; full-function remote control; headphone jack with adjustable level; sound audible during fast scan. Cues by track number. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track, remaining time on disc. 16.91" W × 2.98" H × 10.78" D; 9.81 lbs ..... \$449

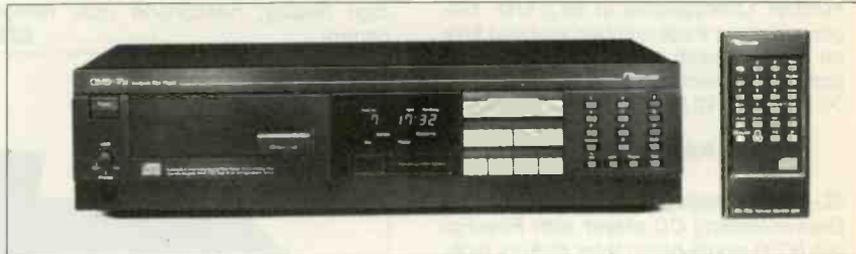
#### CD-500E Compact Disc Player

Drawer-loading CD player with 12-function remote control. Features programming of 15 tracks in any order; skip forward; skip back; repeat disc, program, 3-beam laser; headphone jack with adjustable level; analog filtering. Cue by track number. Displays current track number, program in memory. 16.91" W × 2.98" H × 10.78" D; 9.81 lbs .. \$329

### NAKAMICHI

#### OMS-7All Compact Disc Player

Drawer-loading CD player. Features 3-beam laser; digital filtering (resampling frequency 176.4 kHz); dual 16-bit, glitch-free D/A converters; programming of 24 tracks in random order; display of cur-



*Nakamichi OMS-7All CD Player*

rent track number, elapsed time of current track, remaining time on disc, program stored in memory; sound audible during fast forward and fast reverse; skip forward; skip back; fast forward; fast reverse; cancel; repeat disc, program; cue by track number, index number; 7-function remote control; headphone jack with adjustable level. Max line output 2 V; headphone output 35 mW; THD at 1,000 Hz 0.0025%; S/N >104 dB; sep >100 dB; FR 5-20,000 Hz ± 0.5 dB; 16 lbs; 17.12" W × 3.94" H × 12.12" D . \$1,650  
**OMS-5All.** Similar to OMS-7All without remote and programming functions ..... \$1,375

#### OMS-4A Compact Disc Player

Drawer-loading CD player with shunt-connected de-glitching; multi-regulated power supply; magnetic chuck; remote control. Features programming of 15

tracks in any order; skip forward; skip back; fast forward; fast reverse; cancel; headphone jack with adjustable headphone level; 3-beam laser; 16-bit digital filter; dual D/A converters. Oversamples at 176.4 kHz; Displays current track number, elapsed time on disc. Headphone output 8 mW/8 ohms. 16.94" W × 3.95" H × 12.81" D; 15 lbs ..... \$995

#### OMS-3A Compact Disc Player

Drawer-loading CD player with shunt-connected de-glitching; multi-regulated power supply; magnetic chuck; remote control. Features programming of 15 tracks in any order; skip forward; skip back; fast forward; fast reverse; cancel; headphone jack with adjustable headphone level; 3-beam laser; 16-bit digital filter; single D/A converter. Oversamples at 176.4 kHz; Displays current track number, elapsed time on disc. Headphone output 8 mW/8 ohms. 16.94" W × 3.95" H × 12.81" D; 15 lbs ..... \$699

### ONKYO

#### Integra DX-320 Compact Disc Player

Drawer-loading CD player with Opto-coupling system using 6 fiber-optic coupling modules to electrically separate the digital and analog sections for improved digital-to-analog conversion. Features separate power supplies for the digital, analog, and 3-motor/transport sections; programming of 16 tracks in random or sequential order; skip forward; skip back; fast forward fast reverse; cancel; repeat track, disc, phrase, and program; 13-function remote control; timer play switch for use with an audio timer; headphone jack with adjustable level; 3-beam

laser; 96-stage digital filter; 7-pole shielded analog filter; single D/A converter; sound audible during fast scans; optical play switch; super-servo and delta power supply in analog section; common-mode noise filter; vibration damping Cues by track and index number. Oversamples at 88.2 kHz. Displays current track number, elapsed time on disc, remaining time on disc, program in memory. 17.12" W × 3.62" H × 14" D; 13 lbs ..... \$580  
**CW-320.** Optional wood-grain side panels for DX-320 ..... \$60/pr

#### DX-220 Compact Disc Player

Drawer-loading CD player with Opto-coupling system using 1 Opto-coupling fiber optic module to electrically separate the digital and analog sections for improved digital-to-analog conversion. Features separate power supplies for the digital, and analog sections; program-

ming of 16 tracks in random or sequential order; skip forward; skip back; fast forward fast reverse; cancel; repeat track, disc, and program; 10-function remote control; headphone jack with adjustable level; 3-beam laser; 20-stage digital filter; 7-pole analog filter; single D/A converter; sound audible during fast scans. Cues by track number. Oversamples at 88.2 kHz. Displays current track number, elapsed time on disc, remaining time on disc, program in memory. 17.12" W X 3.62" H X 13.75" D . \$400

#### DX-120 Compact Disc Player

Drawer-loading CD player with custom analog-output common-mode noise filters to remove extraneous digital noise from the analog-output signal. Features programming of 16 tracks in random or sequential order; skip forward; skip back; fast forward fast reverse; cancel;



Onkyo DX-120 Compact Disc Player

repeat track, disc; 3-beam laser; 20-stage digital filter; 7-pole analog filter with gradual rolloff to preserve phase accuracy; single D/A converter; sound audible during fast scans. Cues by track number. Oversamples at 88.2 kHz. Displays current track number, elapsed time on disc, elapsed time of current track; program in memory. 17.12" W X 3.62" H X 13.75" D; 10 lbs . . . . . \$300

#### PANASONIC

#### SL-P3600 Compact Disc Player

Drawer-loading CD player with Fine-Focus (FF1) single-beam laser pickup, high-speed linear motor to minimize access time, high-resolution digital filter to enhance sound quality; large multi-function FL display. Features programming of 20 tracks in any order; skip forward; skip back; 2-speed fast forward and reverse; repeat track, disc, and program; floating isolation system to isolate optical deck from external vibrations; ultra-compact brushless direct-drive spindle motor; preset playing time operation. Samples at 44.1 KHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc, remaining time on track, program stored in memory. 16.88" W X 3.03" H X 10.44" D . . . . . \$270

#### PIONEER ELECTRONICS

#### PD-9010X Compact Disc Player

Drawer-loading CD player. Features three-beam laser; digital filtering (resampling frequency 176.4 kHz); program-

ming of 32 tracks in random order; sound audible during FF and FR; skip forward; skip back; cancel; repeat track, disc, program; remote control; headphone jack with adjustable level. Displays current track number, elapsed time of current track, remaining time on disc, program stored in memory. Cues by track number, index number. Max line output 2 V; THD at 1,000 Hz 0.001% at -0 dB; S/N 98 dB; 18"W x 3.75"H x 12.19"D . . \$540

#### PD-7030(BK) Compact Disc Player

Features auto-program edit; auto-pause programming; program-time calculation; programming of 24 tracks in any order; track and index search; 2-speed audible manual search; repeat disc, program; multi-mode display; disc stabilizer; honeycomb chassis; headphone jack with adjustable volume; remote control. Oversamples at 88.2 kHz . . . . . \$470

#### PD-6030(BK) Compact Disc Player

Features programming of 24 tracks in any order; track search; 2-speed audible manual search; repeat disc, program; disc stabilizer; honeycomb chassis; 6-digit display; headphone jack; remote control . . . . . \$350



Pioneer PD-7030(BK) CD Player

#### PD-5030(BK) Compact Disc Player

Features programming of 24 tracks in any order; track search; 2-speed audible manual search; repeat entire disc; repeat program. Includes disc stabilizer; honeycomb chassis; 6-digit display; and headphone jack . . . . . \$300

#### PROTON

#### 830R Compact Disc Player

Features programming of 20 tracks; fast scan; real-time digital display; repeat function; headphone jack with adjustable level; remote control . . . . . \$349

#### QUASAR

#### CD8956 Compact Disc Player

Drawer-loading 20-step random-access CD player with direct access. Features high-speed linear-motor access system; skip forward; skip back; fast forward; fast reverse; cancel; programming of 20 tracks in any order; repeat track, phrase, disc, and program; one-beam laser; single D/A converter; 96th-order FIR double oversampling filter; sound audible during fast scan. Cues by track and index number. Samples at 44.1 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc; 16.94" W X 3.03" H X 0.19" D . . . . . \$250

#### RCA

#### MCD-145 Dimensia Compact Disc Player

Drawer-loading CD player. Features 3-beam laser; programming of 15 tracks in random order; skip forward; skip back; cancel; repeat track, disc, program; full-function remote control; headphone jack with adjustable level; automatic status indication and switching; local or remote programming; display of all functions on Dimensia monitor; use of standard or system link cabling. Displays current track number, elapsed time of current track. Cues by track number, index number. Max line output 1.8 V; THD at 1,000 Hz > or equal to 0.005% at -0 dB; S/N > or equal to 90 dB; sep > or equal to 80 dB; FR 20-20,000 Hz  $\pm 1$  dB; 17.12" W X 3.36" H X 11.12" D . . . . . \$399

#### MCD-141 Digital Command CD Player

Drawer-loading CD player. Features 3-beam laser; programming of 15 tracks in random order; skip forward; skip back;

fast forward; fast reverse; cancel; repeat track, disc, program; full-function remote control. Displays current track number, elapsed time of current track. Cues by track number, index number. Max line output 1.8 V; THD at 1,000 Hz > or equal to 0.005% at -0 dB; S/N > or equal to 90 dB; sep > or equal to 80 dB; FR 20-20,000 Hz  $\pm 1$  dB; 17.12" W X 3.36" H X 11.12" D; approx. . . . . \$399

#### CD180 Compact Disc Player

Drawer-loading CD player. Features 3-beam laser; programming of 15 tracks in random order; audible 2-speed forward

and reverse scan; skip forward; skip back; repeat disc, track, program; fluorescent display of track and elapsed track time; independent disc suspension system. Max line output 2 V; THD at 1,000 Hz 0.005%; S/N 90 dB; sep at 1,000 Hz 90 dB; FR 5-20,000 Hz. 17.12" W X 2.88" H X 10.36" D; approx. \$199

**REALISTIC****CD-1400 Compact Disc Player**

Drawer-loading CD player with infrared remote control. Features three-beam laser; programming of 15 tracks in random order; sound audible during FF and FR; repeat function-track, disc. Displays current track number, elapsed time of disc, elapsed time of current track, index number, repeat mode. Access by index code. FR 5-20,000 Hz +0.5,-1dB; dynamic range 90 dB; S/N 90 dB; ch sep 90 dB. 14.56" W X 2.89" H X 10.36" D .. \$260

**CD-2200 Compact Disc Player**

Drawer-loading CD player. Features three-beam laser; programming of 15 tracks in random order; sound audible during FF and FR; repeat function, track,



*Realistic CD-2200 CD Player*

disc; Displays current track number, elapsed time of disc, elapsed time of current track, index number, repeat mode. Access by index code. FR 5-20,000 Hz +0.5 -1dB; dynamic range 90 dB; S/N 90 dB; ch sep 90 dB. 12.62" W X 3.31" H X 12.06" D; 8.6 lbs ..... \$200

**REVOX****B 225 Compact Disc Player**

Drawer-loading Compact Disc player with infrared or wired remote and 1,000-Hz calibration tone corresponding to max output level. Features 1-beam laser; digital filtering (resampling frequency 176.4 kHz); programming of 19 tracks; display of current track number, elapsed time of current track, elapsed time of disc, program stored in memory; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; cue by track number, index number, time; 7-function remote control; headphone jack (adjustable output). Access time 3 seconds or less. Max line output 2 V; headphone output 13 V (600 ohms); THD 0.006% at 1,000 Hz at rated output; S/N 96 dB; sep 90 dB; FR 20-20,000 Hz +0, -0.6 dB ..... \$849

**ROTEL****RCD850 Compact Disc Player**

Drawer-loading CD player with programming of 9 tracks in random or sequential order. Features skip forward; skip back; fast forward; fast reverse; cancel; repeat track; repeat disc; 3-beam laser;



*Rotel RCD-850 CD Player*

high-slope digital filtering; 3rd-order analog filtering; single D/A converter. Samples at 44.1 kHz. Cues by track number. Displays current track number, elapsed time of current track. 17" W X 3.81" H X 11.44" D; 9 lbs ..... \$399

**SANSUI****CD-E750 Compact Disc Player**

Drawer-loading CD player. Features programming of 8 tracks in any order; fast forward; fast reverse; repeat track, disc, program; headphone jack with adjustable level; 3-beam laser; combination digital/analog filtering; sound audible during fast scan. Cues by track number, index number. Displays current track number, elapsed time on disc, remaining time on disc, program in memory. 9.9 lbs; 14.97" W X 3.62" H X 12.19" D .. \$400

**CD-V350.** Similar to CD-E750 except no display of program in memory. 16.94" W X 3.22" H X 12.36" AD; 8.8 lbs .. \$400

**CD-V550R Compact Disc Player**

Drawer-loading CD player with auto spacing to add 4-second blanks between dubbing sections. Features programming of 16 tracks in any order; fast forward; fast reverse; repeat track, disc, program; 4-function remote control; headphone jack with adjustable level; combination digital/analog filtering; 3-beam laser; sound audible during fast scan. Cues by track number, index number, time. Displays current track number,

elapsed time of current track, elapsed time on disc, remaining time on disc, program in memory ..... \$370

**SANYO****CP 710 Compact Disc Player**

Features 16-selection memory; 3-beam

laser; skip forward; skip back; repeat disc, track; 2-speed fast forward and reverse; 8-digit fluorescent display; wireless remote control ..... \$300

**CP 700.** As above without remote control ..... \$250

**SCOTT****960DA Compact Disc Player**

Drawer-loading CD player with Large Scale Integrated (LSI) circuitry for improved reliability. Features programming of 15 tracks in any order; skip forward; skip back; fast forward; fast reverse; repeat track, disc, program; 8-function remote control; 3-beam laser; 7th-order analog filtering; single D/A converter; sound audible during fast scan. Cues by track number. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc, program in memory. 11.1 lbs; 17.25" W X 3.75" H X 11" D .... \$350

**950DA.** Same as above without remote control ..... \$300

**SEARS ROEBUCK****9755 Compact Disc Player**

Drawer-loading CD player with direct, index, and skip search. Features 3-beam laser; programming of 15 tracks in any order; skip forward; skip back; fast forward; fast reverse; repeat track, disc, and program; 10-key remote control; headphone jack. Displays current track number, elapsed time of current track, elapsed time on disc. 370 mm W X 72 H X 365 D; 3.3 kg ..... \$230

**9754 Compact Disc Player**

Drawer-loading CD player with direct, index, and skip search. Features 3-beam laser; programming of 15 tracks in any order; skip forward; skip back; fast forward;

For explanations of abbreviations, specifications, and technical terms, turn to the dictionary on page 149.

ward; fast reverse; repeat track, disc, and program; headphone jack. Displays current track number, elapsed time of current track, elapsed time on disc, program in memory. 370 mm W X 72 H X 365 D; 3.3 kg ..... \$180

**SHARP****DX-620(BK) Compact Disc Player**

Horizontal-drawer-loading CD player with 3-way music search system (APMS, APLD, APSS) and infrared remote control. Features programming of 9 tracks;



Sharp DX-620 Compact Disc Player

cue and review; LCD digital time counter; displays playback time in minutes and seconds; headphone jack. 17" W X 3.12" H X 11.75" D; 9.7 lbs ..... \$300

**DX-110(BK) Compact Disc Player**

Drawer-loading CD player with 2-way music search (Auto Program Locate Device (APLD), Auto Program Search System (APSS)). Features cue and review; one-beam laser; LCD digital time counter; displays playback time in minutes and seconds; headphone jack. Tray sensor automatically retracts at touch of finger. 13" W X 3.12" H X 11.75" D; 10.4 lbs ..... \$250

**DX-610(BK).** As above except 17" W, 11.7 lbs ..... \$260

**SHERWOOD****CDP-300R Compact Disc Player**

Drawer-loading CD player remote compatible with Sherwood remote-controlled receivers. Features programming of 20 tracks in any order; skip forward; skip back; fast forward; fast reverse; one-beam laser; 4x-oversampling digital filtering; 1st-order linear-phase analog filtering; sound audible during fast scan. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track, elapsed time on disc. 17.36" W X 3.25" H X 9.75" D; 11 lbs ... \$400

**CDP-310R.** As above with remote control ..... \$450

**SHURE BROTHERS****D6000 Compact Disc Player**

Drawer-loading CD player with remote control including remote volume. Programs 15 tracks in any order. Features skip forward; skip back; fast forward; fast reverse; cancel; repeat track; repeat disc; repeat phrase; repeat program; cue by track; cue by time; 19-function re-

mote; headphone jack; with adjustable head level; three-beam; oversamples at 88.2 kHz; independent L/R digital filters 80 dB attenuation; five-pole active above 30,000 Hz analog filtering; dual D/A converter; display of current track number; display of elapsed time of current track; display of program in memory; sound audible during fast scan. Headphone output 5 V; 16.9" W X 2.9" H X 12.9" D \$599

**SV40 Compact Disc Player**

Drawer-loading CD player with volume control included on 17-function remote.

Programs 15 tracks in any order. Features skip forward; skip back; fast forward; fast reverse; cancel; repeat track; repeat disc; repeat program; cue by track; headphone jack; with adjustable level; three-beam; samples at 44.1 kHz; dual-break-point analog filtering; single D/A converter; display of current track number; display of elapsed time of current track; display of program in memory; sound audible during fast forward and fast reverse. Headphone output 5 volts; 9 lbs, 11 ozs; 16.9" wide X 2.9" high X 10.6" deep ..... \$399

**D5000 Compact Disc Player**

Drawer-loading Compact Disc player with 14-function wireless remote control and 16-bit process with double oversampling. Programming of up to 15 tracks in any order. Features skip forward; skip back; fast forward; fast reverse; cancel; repeat track; repeat disc; repeat phrase; repeat program; three-beam laser; oversamples at 88.2 kHz; digital filtering; analog filtering; single D/A converter; display of current track number; display of elapsed time of current track; display of program in memory; sound audible during fast scan. 11 lbs; 16.9" W X 3.9" H X 10" D ..... \$399



Sonographe SD-1 CD Player

**SONOGRAPHE  
by CONRAD-JOHNSON****SD-1 Compact Disc Player**

Drawer-loading CD player with discrete FET audio circuits and power supplies designed by Conrad-Johnson. Features programming of 20 tracks in any order; skip forward; skip back; fast forward; fast reverse; repeat disc, program; headphone jack; digital filtering; dual D/A converters; sound audible during fast scan. Cues by track and index number. Oversamples at 176.4 kHz. Displays current track number, program in memory elapsed time of current track. 18" W X 3.75" H X 12" D; 8.5 lbs ..... \$695

**SONY****CDP-650ESD II Compact Disc Player**

Drawer-loading CD player. Features 3-beam laser; digital filtering (resampling frequency 88.2 kHz) programming of 20 tracks in random order; sound audible during FF and FR; skip forward; skip back; cancel; repeat track, disc, phrase, program; 20-function remote control; dual D/A converters; linear motor; headphone jack with adjustable level; digital output stage; auto-delex; shuffle play. Displays current track number, elapsed time of current track, elapsed time of disc, remaining time on disc, program stored in memory. Cues by track number, index number. Max line output 2 V; THD at 1,000 Hz 0.0025%; IMD 0.0025%; S/N 96 dB; sep 96 dB; FR 2-20,000 Hz  $\pm 0.3$  dB; 20 lbs; 17" W x 3.12" H X 14" D ..... \$1,300

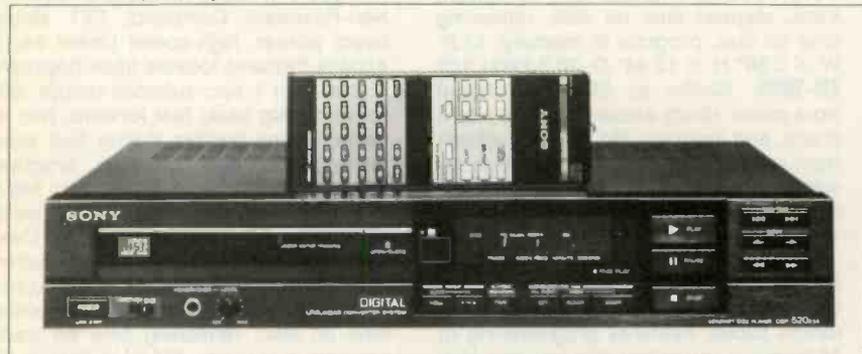
**CDP-620ES II—Featured on Cover**

Drawer-loading CD player. Features 3-beam laser; digital filtering (resampling frequency 88.2 kHz) programming of 20 tracks in random order; sound audible during FF and FR; skip forward; skip back; FF; FR; cancel; repeat track, disc, phrase, program; 20-function remote control; dual D/A converter; linear motor; headphone jack with adjustable level; auto delex; shuffle play. Displays current track number, elapsed time of current track, elapsed time of disc, remaining time on disc, program stored in memory. Cues by track number, index number. Max line output 2 V; THD at 1,000 Hz 0.0025%; IMD 0.0025%; S/N 96 dB; sep 96 dB; FR 2-20,000 Hz  $\pm 0.3$  dB; 20 lbs; 17" W X 3.12" H X 14" D ..... \$950

**CDP-520ES II Compact Disc Player**

Drawer-loading CD player. Features 3-beam laser; digital filtering (resampling frequency 88.2 kHz); programming of 16 tracks in random order; sound audible during FF and FR; skip forward; skip back; FF; FR; cancel; repeat track, disc, phrase, program; 15-function remote control; headphone jack with adjustable

gram; 12-function remote control; 3-beam laser; 96th-order digital filtering; final-stage analog filtering; single D/A converter; sound audible during fast scan. Cues by track number, Index number, time. Displays current track number, elapsed time of current track, remaining time on disc, program stored in memory. Oversamples at 88.2 kHz . . . . . \$500



Sony CDP-520ESII CD Player

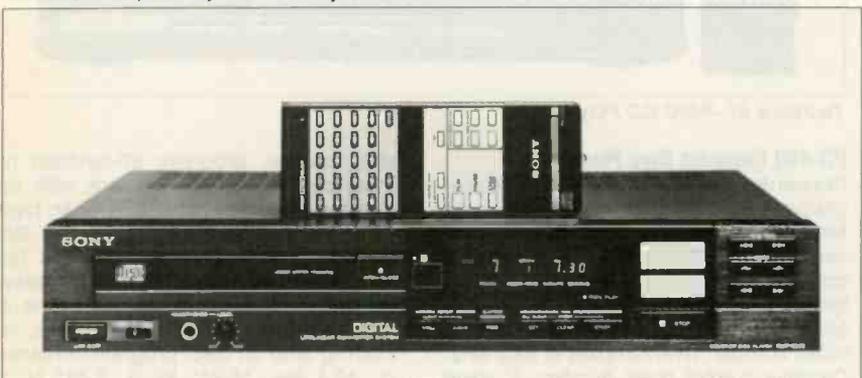
level. Displays current track number, elapsed time of current track, remaining time on disc, program stored in memory. Cues by track number, Index number, time. Max line output 2 V; THD at 1,000 Hz 0.003%; IMD 0.003%; S/N 96 dB; sep 96 dB; FR 2-20,000 Hz  $\pm$  0.3 dB; 15 lbs; 17" W  $\times$  3.12" H  $\times$  13.25" D . . . . \$600

**CDP-520ES II Compact Disc Player**

Drawer-loading CD player. Features 3-beam laser; digital filtering (resampling frequency 88.2 kHz); programming of 16 tracks in random order; sound audible during FF and FR; skip forward; skip back; FF; FR; cancel; repeat track, disc, phrase, program; 15-function remote control; headphone jack with adjustable

**CDP-55 Compact Disc Player**

Drawer-loading Compact Disc player features programming of up to 20 tracks in any order and programming of up to 99 tracks in sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, and program; 11-function wireless remote control; 3-beam laser; 96th-order digital filtering; single digital-to-analog converter; sound audible during fast forward and fast reverse. Cues by both track number, and index number. Displays current track number, elapsed time of current track, remaining time of entire disc, and program stored in memory. Oversamples at 88.2 kHz. 17" W  $\times$  3.25" H  $\times$  13" D; 11 lbs . . . . . \$400



Sony CDP-302II CD Player

level. Displays current track number, elapsed time of current track, remaining time on disc, program stored in memory. Cues by track number, index number. Max line output 2 V; THD at 1,000 Hz 0.003%; IMD 0.003%; S/N 96 dB; sep 95 dB; FR 2-20,000 Hz  $\pm$  0.5 dB; 15 lbs; 17" W  $\times$  3.12" H  $\times$  13.25" D . . . . . \$550

**CDP-203 Compact Disc Player**

Drawer-loading CD player features programming of 20 tracks in any order, 99 tracks in sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, pro-

**CDP-50 Compact Disc Player**

Drawer-loading CD player features programming of 20 tracks in any order, 99 tracks in sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; 11-function remote control; 3-beam laser; 9-pole final-stage analog filtering; single D/A converter; sound audible during fast scan. Cues by track number, index number. Displays current track number, elapsed time of current track, remaining time on disc, program stored in memory. 17" W  $\times$  3.25" H  $\times$  13" D; 11 lbs . . . . . \$370

**CDP-45 Compact Disc Player**

Drawer-loading CD player features programming of 20 tracks in any order, 99 tracks in sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; 6-function remote control optional; 3-beam laser; 9-pole final-stage analog filtering; single D/A converter; sound audible during fast scan. Cues by track number, Index number. Displays current track number, elapsed time of current track, remaining time on disc, program stored in memory. 17" W  $\times$  3.25" H  $\times$  13" D; 11 lbs . . . . . \$330

**CDP-7F Compact Disc Player**

Top-loading CD player. Features 3-beam laser; programming of 16 tracks in random order; sound audible during FF and FR; skip forward; skip back; FF; FR; cancel; repeat track, disc, program; 4-function remote control; headphone jack with adjustable level. Displays current track number, elapsed time of current track, remaining time on disc, program stored in memory. Cues by track number. Max line output 2 V; THD at 1,000 Hz 0.004%; IMD 0.004%; S/N 90 dB; sep 90 dB; FR 2-20,000 Hz  $\pm$  0.5 dB; 9 lbs; 8.5" W  $\times$  3.12" H  $\times$  12" D . . . . . \$300

**CDP-35 Compact Disc Player**

Drawer-loading CD player features programming of 20 tracks in any order, 99 tracks in sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; 3-beam laser; 9-pole final-stage analog filtering; single D/A converter; sound audible during fast scan. Cues by track number, index number. Displays current track number, elapsed time of current track, remaining time on disc, program stored in memory. 14" W  $\times$  3.25" H  $\times$  13" D; 10 lbs . . . . . \$270

**CDP-25 Compact Disc Player**

Drawer-loading CD player features programming of 16 tracks in any order, 99 tracks in sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; 3-beam laser; 9-pole final-stage analog filtering. Cues by track number, index number . . . . . \$270

**D-170 Mini Compact Disc Player**

Drawer-loading CD player features programming of 16 tracks in any order, 99 tracks in sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; 3-beam laser; 7-pole final-stage analog filtering; single D/A converter; sound audible during fast scan. Cues by track number. Displays current track number, elapsed time of current track, elapsed time on disc; remaining time on disc, program stored in memory. 7.5" W  $\times$  3" H  $\times$  14" D; 9 lbs . . . . . \$265

**SYLVANIA****CD1560 Compact Disc Player**

Drawer-loading CD player with 3-speed search fast forward/reverse. Features 8-

function infrared remote control; skip forward; skip back; 20-track random access programming; digital filtering; 4X oversampling; dual 16-bit D/A converter; anti-jamming protection; repeat; track/total, time/memory displays; LED function indicators; pause; line output jacks; digital output jacks. 16.5" W X 3.5" H X 11.75" D ..... \$330

#### FDE203 Compact Disc Player

Drawer-loading CD player. Features skip forward; skip back; fast forward; fast reverse; repeat track and program; 20-track random access programming; single-stage servo tracking; soft muting; 4X oversampling. 16.5" W X 3.5" H X 11.75" D ..... \$299

#### CD1460 Compact Disc Player

Drawer-loading CD player with 3-speed search forward/reverse. Features skip forward; skip back; 20-track random access programming; digital filtering; 4X oversampling; dual 16-bit D/A converter; anti-jamming protection; repeat; track/total, time/memory displays; LED function indicators; pause; headphone jack; line output jacks; digital output jacks. Optional remote control available. 16.5" W X 3.5" H X 11.75" D .... \$250

#### CD1150 Compact Disc Player

Drawer-loading CD player with 3-speed audible search forward/reverse. Features skip forward; skip back; memory programming; digital filtering; 4X oversampling; store/cancel/review; pause; LED function indicators; pause; headphone jack; line output jacks; digital output jacks. 12.5" W X 3.5" H X 11.75" D ..... \$240

### TANDBERG

#### TCP 3015A Compact Disc Player

Drawer-loading CD player with all analog signal path circuits completely direct coupled and discrete. Programs tracks in any order. Features skip forward; skip back; fast forward; fast reverse; cancel; repeat track; repeat disc; repeat phrase; repeat program; cue by track; full-function remote; headphone jack; with adjustable level; one-beam laser; oversamples at 176.4 kHz; dual D/A converter; display of current track number; display of elapsed time of current track; display of program in memory; sound audible during fast scan. 12.5 lbs; 17.12" W X 3.5" H X 13.75" D ..... \$1,295  
**Remote Control.** ..... \$98  
**Universal Remote.** ..... \$138

### TEAC

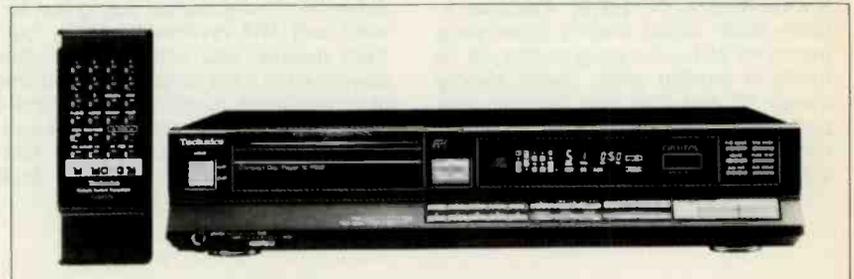
#### ZD-5000 Compact Disc Player

Drawer-loading CD player with zero-distortion circuit, gold-plated fixed and variable outputs, intro check, timer play, subcode output, in-operation program editing, variable volume from remote, all-metal chassis, floating isolation system, heavy-duty audiophile-grade insulator feet, RC-301 20-function remote control included. Features programming of 20 tracks in any order; skip forward; skip

back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; headphone jack with adjustable level; 3-beam laser; oversampling digital filter; 7th-order analog filtering; dual D/A converters; sound audible during fast scan. Cues by track and index number. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc, program in memory. 17.5" W X 3.88" H X 13.44" D; 20.2 lbs \$1,100  
**ZD-3000.** Similar to ZD-5000 without front-panel direct-access keypad, intro check, and indexing. No variable volume from remote (front panel only); large insulator feet. Includes RC-301 remote control. 17.5" W X 3.44" H X 13.44" D; 17.6 lbs ..... \$950

#### ZD-700 Compact Disc Player

Drawer-loading CD player with zero-distortion circuit. Features programming of 16 tracks in any order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; headphone jack with adjustable level; 15-function remote control; 3-beam laser; digital filter; 7th-order analog filtering; single D/A converter; sound audible during fast scan. Cues by track and index number. Samples at 44.1 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc. 17.12" W X 2.89" H X 11.62" D; 16 lbs ..... \$699



Technics SL-P500 CD Player

#### PD-400 Compact Disc Player

Drawer-loading CD player. Features programming of 16 tracks in any order; skip forward; skip back; fast forward; fast reverse; repeat track, disc, phrase, program; 8-function remote control; 3-beam laser; single D/A converter; sound audible during fast scan. Cues by track and index number. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track. 17" W X 2.94" H X 10.89" D; 7.75 lbs ..... \$449  
**PD-200.** Similar to PD-400 without remote control and oversampling ... \$399  
**PD-100** ..... \$349

### TECHNICS

#### SL-P1200 Disco Compact Disc Player

Top-loading CD player designed for use in discos or production environments. Cues CD to any track or any point within a track. Rocker control allows momentary advance or retard of music. Quartz-locked pitch control ( $\pm 8\%$ ) and 2-speed cueing. Features rear-panel remote jack for mixer; infrared remote control; auto

cue to automatically position pick-up at first note of desired track; FL display; twin high-speed D/A converter; high-resolution double-sampling digital filter; 9th-order low-pass analog filtering; Class AA operation of sample and hold circuitry; Class AA output amp; steel/zinc die-cast double-isolated anti-resonant chassis damped with heavy rubber and Technics' Non-Resonant Compound; FF1 single-beam pickup; high-speed Linear Motor Access Systems locates track beginning in less than 1 sec; subcode output; skip forward; skip back; fast forward; fast reverse; sound audible during fast scan; repeat track, disc, program, programming of 20 tracks in any order; headphone jack with adjustable level. Cues by track number, index number, time. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc, remaining time on track, program in memory, 17" W X 7" H X 15" D; 22 lbs ..... \$1,000

#### SL-P500 Compact Disc Player

Drawer-loading CD player with Fine Focus Single Beam (FF1) laser pickup, copper-plated styrol capacitors and audio-application electrolytic capacitors in analog circuitry. Average access time to each track is approx 0.8 seconds. Features programming of 20 tracks in any order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track,

disc, phrase, program; 27-function remote control; headphone jack with adjustable level; one-beam FF1 laser; high-resolution digital filtering; single D/A converter; sound audible during fast scan. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc, program in memory. 10.1 lbs; 16.94" W X 3.44" H X 10.84" D ..... \$520

#### SL-P310 Compact Disc Player

Drawer-loading CD player with remote programming, access, and volume control. Features programming of 20 tracks in any order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, program; 20-function remote control; headphone jack; one-beam laser; digital filtering; single D/A converter; sound audible during fast scan. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc, program in memory. 16.94" W X 3.03" H X 9.44" D ..... \$375

**SL-P110 Compact Disc Player**

Drawer-loading CD player with 96th-order high-resolution FIR double-oversampling digital filter, Tchebyshev active low-pass analog filter, and friction-free 4-wire suspension system to support the combined-collimator focus lens. Features programming of 20 tracks in any order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, program; one-beam laser; single D/A converter; sound audible during fast scan. The linear motor is used in the laser pickup traverse mechanism provides a high-speed max access time of 1.2 seconds to any destination on disc. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc, program in memory. 16.94" W X 3.03" H X 9.44" D . . . \$320

**SL-PJ11 Compact Disc Player**

Drawer-loading CD player with a digital noise canceller, digital phase limiter, and drop-out protection circuits to eliminate crosstalk problems between the focus-error and tracking-error signals. Features programming of 15 tracks in any order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, program; one-beam laser; analog filtering; single D/A converter; sound audible during fast scan. Samples at 44.1 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc, program in memory . . . \$300

**TOSHIBA****XR-V11 Compact Disc Player**

Drawer-loading CD player. Features 3-beam laser; digital filtering (resampling frequency 88.2 kHz); programming of 8 tracks in random order; sound audible during fast forward and fast reverse; skip forward; skip back; fast forward; fast reverse; repeat track, program; headphone jack with adjustable level. Displays current track number, elapsed time of current track, elapsed time of disc, remaining time on disc, program stored in memory. Cues by track number. Max line output 2.0 V; headphone output 0-5 V; total harmonic distortion at 1,000 Hz 0.003%; signal-to-noise ratio 96 dB; sep 90 dB; frequency response 20-20,000 Hz  $\pm 1.0$  dB . . . \$499

**XR-35 Compact Disc Player**

Drawer-loading CD player with 10-key remote control. Features 3-beam laser; programming of 16 tracks in any order; fast forward; fast reverse; repeat track. Displays current track number, elapsed time on disc. 16.53" W X 3.19" H X 12.16" D; 9 lbs . . . \$350

**XR-30 Compact Disc Player**

Drawer-loading CD player with 16-program random memory and auto repeat. Features 3-beam laser; fast forward; fast reverse; repeat disc. Displays current track number, elapsed time on disc, remaining time on disc. 16.53" W X 3.19" H X 12.16" D; 9 lbs . . . \$300

**VECTOR RESEARCH****VCD-900 Compact Disc Player**

Drawer-loading CD player with full-function remote control (10-key direct-track access, remote volume control). Features programming of 15 tracks in random and sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, and program; 3-beam laser; digital and analog filtering; single D/A converter; sound audible during fast scans. Cues by track number. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track, elapsed time on disc; program in memory. 17" W X 3.5" H X 12.5" D; 11 lbs . . . \$500

**VCD-770 Compact Disc Player**

Drawer-loading CD player with 12-key remote control and quadruple oversampling. Features programming of 15 tracks in random and sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, and program; 3-beam laser; digital filtering; single D/A converter; sound audible during fast scans. Cues by track number. Oversamples at 176.4 kHz. Displays current track number, elapsed time of current track, elapsed time on disc; remaining time on disc; program in memory. 17" W X 3.5" H X 8.25" D; 11 lbs \$350

**YAMAHA****CD-2000M Compact Disc Player**

Features Yamaha LSI technology; 3-beam laser; independent L/R ch digital filters; vibration damping circuit assembly; 10-key direct-selection access; 12-selection programmable random-access playback; index search; 3-way music search; 3-way repeat play; 6-digit multi-



*Yamaha CD-2000M Compact Disc Player*

function fluorescent display; fixed-/variable-level output terminals; output-level volume controls and display; space-insert function; 10-key remote with volume control; timer-operated playback; front-panel headphone jack; gold-plated output terminals; XLR connectors; rack-mount adapters. 17.12" W X 3.75" H X 11.12" D; 11.4 lbs . . . \$899

**CD-2000B Compact Disc Player**

Features Yamaha LSI technology; 3-beam laser; independent L/R ch digital filters; vibration damping circuit assembly; 10-key direct-selection access; 12-selection programmable random-access playback; index search; 3-way music search; 3-way repeat play; 6-digit multi-function fluorescent display; fixed-/vari-

able-level output terminals; output-level volume controls and display; space-insert function; 10-key remote with volume control; timer-operated playback; front-panel headphone jack; subcode output terminal; gold-plated output terminals. 17.12" W X 3.75" H X 11.12" D . . . \$799

**CD-1000B Compact Disc Player**

Features Yamaha LSI technology; 3-beam laser; double-resolution digital filter; vibration damping circuit assembly; 10-key direct-selection access; 12-selection programmable random-access playback; index search; 3-way music search; 3-way repeat play; 6-digit multi-function fluorescent display; space-insert function; 10-key remote control; timer-operated playback; front-panel headphone jack; sub-code output terminal; gold-plated output terminals. 17.12" W X 3.75" H X 11.12" D; 11.2 lbs . . . \$699

**CD-700B Compact Disc Player**

Features Yamaha LSI technology; 3-beam laser; double-resolution digital filter; 12-selection programmable random-access playback; index search; 3-way music search; 3-way repeat play; 6-digit multi-function fluorescent display; 10-key direct-selection access; timer-operated playback; 10-key remote control; sub-code output terminal. 17.12" W X 3.81" H X 11.44" D; 10.9 lbs . . . \$599

**CD-500B Compact Disc Player**

Features Yamaha LSI technology; 3-beam laser; double-resolution digital filter; 9-selection programmable random-access playback; index search; 3-way music search; 3-way repeat play; 4-digit multi-function LED display; front-panel headphone jack with adjustable level; 10-key direct-selection access; timer-operated playback; remote control . . . \$399

**CD-400B Compact Disc Player**

Features Yamaha LSI technology; 3-beam laser; double-resolution digital filter; 9-selection programmable random-access playback; index search; 3-way music search; 2-way repeat play; 4-digit multi-function LED display; front-panel headphone jack; timer-operated playback. 17.12" W X 3.75" H X 11.12" D \$319

**CD-300B Compact Disc Player**

Features Yamaha LSI technology; 3-beam laser; double-resolution digital filter; 9-selection programmable random-access playback; index search; 3-way music search; 2-way repeat play; 4-digit multi-function LED display; front-panel headphone jack; timer-operated play. 13.12" W X 3.75" H X 11.12" D . . . \$259

# PORTABLE CD PLAYERS

## CITIZEN CONSUMER PRODUCTS

### CDP-120 Compact Disc Player

Portable CD player with 2 headphone jacks. Programmable for up to 16 selections. Features push button controls: program, memory, repeat, mode, stop, play/pause, cue, and review. LCD Indicator reveals track number, time, and activated mode. AC power supply is built in. FR 20-20,000 Hz; 1.2" H X 5" W X 7.36" D. Available in black or blue ..... \$250

## GENERAL ELECTRIC

### 3-7050 Portable Compact Disc Player

AC/DC portable component system with CD player, cassette deck, and radio. CD section: vertical loading; laser pickup with auto focusing and precision tracking; LCD display for track number, track time, total time, repeat, memory; controls for eject, display, play, pause/stop, FF/Rev; music skip & memory; synchronized recording from CD to cassette. Cassette section: 6-pushbutton tape transport; auto shut-off in play and record modes; Dolby B; 3-digit tape counter. Radio section: AM/FM/FM-stereo; rotary volume, balance, and tuning controls; LED stereo indicator; 5-band graphic EQ; direct on-air recording; 0.25" headphone jack, L/R mikes, AC input with auto AC/DC switching, L/R speakers, L/R aux input and output (RCA), DC input. Black, silver, red. 25.8" X 10" X 6.3" ..... \$400

## HITACHI

### DAP100 Portable Compact Disc Player

Top-loading portable CD player with built-in AC/DC convertor; AA battery



GE 3-7050 Portable System with Compact Disc Player

134 COMPACT DISC BUYERS' GUIDE 1987



Panasonic SL-NP20 Portable AM/FM/CD Player

(X6) operation; automatic repeat function; music scan. Other features include skip forward; skip back; fast forward; fast reverse; repeat track; repeat disc; headphone jack with adjustable level; three-beam laser; analog filtering; single D/A converter; display of current track number; display of elapsed time of current track; sound audible during fast scan. Headphone output 2 V; 2.64 lbs. . . \$350

## JVC

### XL-R10K Portable Compact Disc Player

Portable CD player with accurate pinpoint laser pickup. Features programming of 15 tracks in random order; endless play; skip; music search; remaining-time display; high filter; line-out and headphone jacks; tone switch; battery indicator. Works with rechargeable batteries. Provided AC adapter (AA-R10K). Op-

tional carrying case with rechargeable battery (BN-R10K) available. FR 4-20,000 Hz. 5" W X 1.36" H X 5" D; 15.5 oz \$280

## MAGNAVOX

### CD8850 Portable Compact Disc Player

Vertical-loading CD player with 7 W max continuous RMS power output per ch in "boom-box"-type unit. Features detachable 3-way speaker system; 5-band graphic EQ; cue and review on CD and cassette; 3-way power supply. CD player features skip forward; skip back; headphone jack with adjustable level. Displays current track number. 10" W X 8.75" H X 6.25" D (w/o speakers); 22.5" W X 8.75" H X 6.25" D (with speakers) ..... \$500

### CD8880—Featured on Cover

Portable CD player with radio and cassette deck in "boom-box"-type unit. Includes 3.5 W min RMS output power per ch; stereo cassette deck with electronic tape speed; CD-to-cassette dubbing; 2-way speaker system; 5-band graphic EQ; cue and review on CD and cassette; 3-way power supply. CD player features vertical loading; skip forward; skip back; fast forward; fast reverse; headphone jack with adjustable level; 1-beam laser; dual D/A converters. Cues by track number. Displays current track number. 26" W X 6.75" H X 6" D ..... \$400

## PANASONIC

### RX-CD70 Portable Compact Disc Player

Vertical-loading CD player with a fine-focus single-beam laser system. Part of a 3-piece portable boombox-type unit with dual cassette deck and FM/AM/FM-ste-

reo radio. CD player features programming of 15 tracks in any order; skip forward; skip back; fast forward; repeat track, disc, and program; headphone jack; digital phase comparison system; sound audible during fast scan. Displays current track number, elapsed time on disc, remaining time on disc. Entire unit 30.06" W X 6.89" H X 9.36" D; 15 lbs, 7 oz. .... \$600

**SL-NP20 Portable Compact Disc Player**  
Vertical-loading portable CD player with built-in AM/FM/AM-stereo digital tuner. Features programming of 15 tracks in any order; skip forward; skip back; repeat track, disc, and program; headphone jack with adjustable level; one-beam laser. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc. .... \$350

**SL-NP10 Portable Compact Disc Player**  
Features skip forward; skip back; repeat track, disc, and program; headphone jack with adjustable level; 1-beam laser. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc. 1265 mm W X 22.9 H X 126 D ..... \$280

**QUASAR**

**CD8936 Portable Compact Disc Player**  
Top-loading portable CD player with direct access and switchable high-cut filter for HP output. Features skip forward; skip back; fast forward; fast reverse; headphone jack; repeat disc and track; one-beam laser; single D/A converter; sound audible during fast scans. Cues by track number. Samples at 44.1 kHz. Displays current track number, elapsed time of current track; remaining time on disc. Headphone output 15 mW. 4.97" W X 1.25" W X 4.97" D; 13.8 oz. .... \$240

**REALISTIC**

**CD-3000 Portable Compact Disc Player**  
Top-loading CD player with headphone jack. Features three-beam laser; programming of 16 tracks in random order; sound audible during FF and FR; skip forward, skip back; repeat track. Displays current track number, elapsed time on disc, remaining time on disc. 110 mm W X 70 H X 110 D; 420 g ..... \$280

**SANYO**

**MCD40 Compact Disc Player**  
Portable CD player, AM/FM tuner, cassette deck. Features programming of 16 tracks in any order; auto reverse; syncro dubbing; Dolby NR; soft-touch controls; graphic EQ; line-in and -out jacks; auto stop; 2-way speakers; 3-way power source; LED indicators; LCD ..... \$450

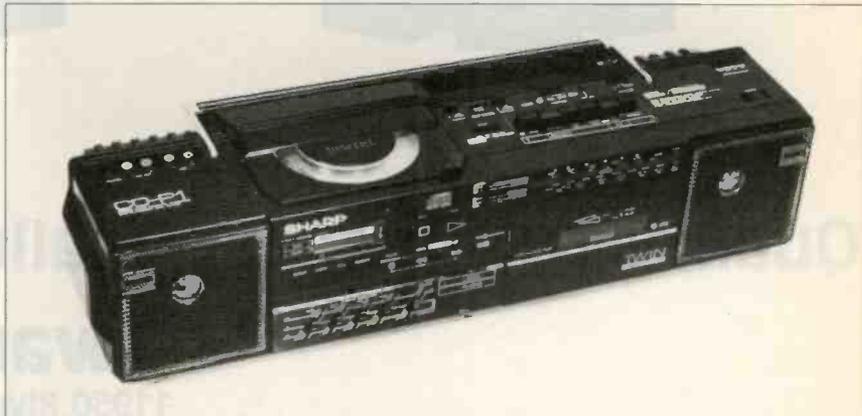
**CP10 Portable CD Player**  
Features multi-function LCD display; AC/DC operation; 16-selection programmability; skip forward and back; search forward and back; headphone jack; repeat disc. Battery pack optional .. \$240

**SONY**

**CFD-W888 Compact Disc Player**  
Portable drawer-loading CD system with AM/FM tuner, speakers, and double tape deck. CD player features programming of 16 tracks in any order, 99 tracks in sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; 3-beam laser; 7-pole digital-stage analog filtering; single D/A converter; sound audible during fast scan. Cues by track number; Displays current track number, elapsed time of current track, elapsed time on disc, re-

maining time on disc, program stored in memory. 22" W X 8.25" H X 6" D; 30 lbs ..... \$650

**CFD-5 Boombox Compact Disc Player**  
Portable, top-loading CD player with AM/FM tuner, amplifier, speakers and a handle. Features 3-beam laser; sound audible during FF and FR; skip forward; skip back; FF; FR; repeat track, disc, headphone jack with adjustable level. Displays current track number, elapsed time of current track, remaining time on disc. Cues by track number. Max line output 2 V; THD at 1,000 Hz 0.008%;



Sharp CD-P1 Portable System with CD Player

**CD COMPATIBLE (BY DESIGN)**



The new AZDEN DSR-50 has been designed specifically to enhance your Compact Disc listening pleasure.

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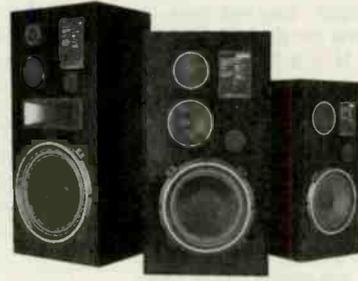
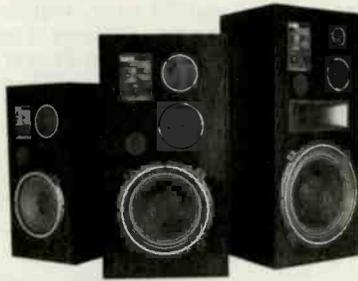
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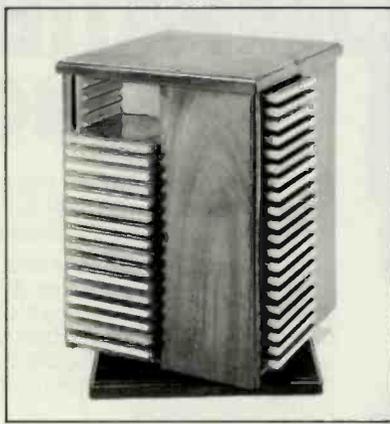


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- SONY SLHF750 ..... Call
- TOSHIBA 5800 ..... 439
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- CELESTION DL 4 ..... 229
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- DENON DCD1300 ..... Call
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- PERREAUX 5150 ..... 2295
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- BLAUPUNKT BPA430 ..... 198
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- CONCORD HPL550 ..... Call
- DENON DCR5420 ..... 329
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IMD 0.008%; S/N 85 dB; sep 85 dB; FR 2-20,000 Hz +1, -3 dB; 17 lbs, 3 oz; 22" (with speakers) W X 8" H X 8" D. \$550

**D-77 Compact Disc Player**

Top-loading portable CD player with AM/FM tuner. Features programming of 16 tracks in any order, 99 tracks in sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; headphone jack with adjustable level; 7-pole final-stage analog filtering; single D/A converter; sound audible during fast scan. Cues by track number. Displays current track number, elapsed time of current track, elapsed time on disc; remaining time on disc, program stored in memory. 5" W X 1" H X 5.25" D ..... \$360

**D-55 Compact Disc Player**

Top-loading portable CD player with FM tuner. Features programming of 16 tracks in any order, 99 tracks in sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; headphone jack with adjustable level; 3-beam laser; 7-pole final-stage analog filtering; single D/A converter; sound audible during fast scan. Cues by track number. Displays current track number, elapsed time of current track, elapsed time on disc; remaining time on disc, program stored in memory. 2.25 lbs ..... \$330

**D-7 Compact Disc Player**

Top-loading portable CD player features programming of 16 tracks in any order, 99 tracks in sequential order; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, phrase, program; headphone jack with adjustable level; 3-beam laser; 7-pole final-stage analog filtering; single D/A converter; sound audible during fast scan. Cues by track number. Displays current track number, elapsed time of current track, elapsed time on disc; remaining time on disc, program stored in memory. 5" W X 1" H X 5.25" D; 2.75 lbs . \$300

**D-7 Deluxe.** Same as D-7 but includes cassette adapter that allows player to work through car or other cassette system. Includes headphones ..... \$330

**D-5SPL Portable CD Player**

Comes with AC adapter for home use; optional battery pack allows portable use. Features 3-beam laser; sound audible during FF and FR; skip forward; skip back; FF; FR; repeat track, headphone jack with adjustable level. Displays current track number, elapsed time of current track, remaining time on disc. Cues by track number. Includes battery and case. Max line output 2 V; THD at 1,000 Hz 0.008%; IMD 0.008%; S/N 85 dB; sep 85 dB; FR 5-20,000 Hz ± 1 dB ... \$270

**TECHNICS**

**SL-XP8—Featured on Cover**

Top-loading portable CD player with built-in quartz-synthesizer AM/FM tuner. Features programming of 18 tracks in any order; 8 AM/8 FM station presets;



Technics SL-XP5 Portable CD Player

skip forward (tune up); skip back (tune down); fast forward; fast reverse; cancel; repeat track, disc, program; headphone jack with adjustable level; one-beam laser; digital filtering; single D/A converter; sound audible during fast scan. Oversamples at 88.2 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc, program in memory. Includes carrying case and power supply. 4.97" W X 1.09" H X 4.97" D \$370

**SL-XP5 Portable Compact Disc Player**

Top-loading portable CD player with FF1 single-beam laser. Features programming of 18 tracks in any order; 8 AM/8 FM station presets; skip forward (tune up); skip back (tune down); fast forward; fast reverse; cancel; repeat track, disc, program; headphone jack with adjustable level; digital filtering; single D/A converter; sound audible during fast scan. Oversamples at 88.2 kHz. Displays current track number, elapsed time of cur-

track/disc, remaining time on disc, program in memory. Includes carrying case and power supply ..... \$300

**TOSHIBA**

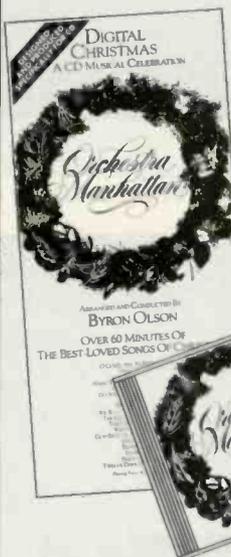
**XR-P9 Portable CD Player**

Top-loading Compact Disc player for home or portable use. Features 2-way power capability; 3-beam laser; programming of 16 tracks in any order; 14-key wireless remote control; skip forward; skip back; repeat track; headphone jack. Displays current track number, elapsed time on disc, remaining time on disc. 4.97" W X 1.56" H X 7.03" D ... \$350

**XR-J9 Portable Compact Disc Player**

Top-loading personal CD player with 16-program random memory and auto repeat. Features 3-beam laser; skip forward; skip back; repeat program; headphone jack. Displays current track number, elapsed time on disc. 9.84" W X 1.84" H X 5.12" D; 2.9 lbs ..... \$250

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DIGITAL CHRISTMAS

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DIGITAL CHRISTMAS featuring Orchestra Manhattan. Conducted by Byron Olson. On Manhattan compact disc.

\*Actual running time 66:23 minutes.

# 3 CD CHANGERS & COMBO PLAYERS

## HITACHI

### DAC50 Compact Disc Player

CD player with ability to load 6 discs and program 32 tracks on any disc in any order. Features skip forward; skip back;

Link Components. Features programming of 15 tracks in any order from 7 discs; oversized fluorescent display; 20 direct-call keys; continuous, programmed, random, and timer play; skip forward; skip back; fast forward; fast reverse;

cancel; repeat track, disc; 32-function remote control; headphone jack with adjustable level; digital filtering; single D/A converter; sound audible during fast scans. Cues by track number. Oversamples at 88.2 kHz. Headphone output 2 V. 17.19" W × 3.36" H × 12.12" D ..... \$600



## LUXMAN

### D-408 Compact Disc/LaserDisc Player

Combination drawer-loading Compact Disc/LaserDisc player with 22-function remote control. CD player features one-beam laser; sound audible during fast forward and fast reverse; skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, program; headphone jack with adjustable level. Displays current track number, elapsed time of current track, the program stored in the memory. Cues by track num-

Luxman D-408 CD/LD Player

ber, index number, time. Max line output 2 V; THD at 1,000 Hz 0.003% at -1 dB; S/N 96 dB; sep 90 dB; FR 5-20,000 Hz -0.5 dB; 34.7 lbs; 16.56" W × 6.62" H × 17.62" D ..... \$1,300

## JVC

### XL-M700BK Multi-Disc CD Player

Drawer-loading CD player with an automatic changer, 6-disc magazine, and single-disc tray for 7-disc playback. Remote controllable with selected JVC Compu-



Parasound CDD-940 CD and Cassette Combo Player

ber, index number, time. Max line output 2 V; THD at 1,000 Hz 0.003% at -1 dB; S/N 96 dB; sep 90 dB; FR 5-20,000 Hz -0.5 dB; 34.7 lbs; 16.56" W × 6.62" H × 17.62" D ..... \$1,300

## MITSUBISHI

### DP-409 Multi Compact Disc Player

CD player with 5-disc auto changer and magazine. Provides continuous or programmed play from any or all 5 discs. Features programming of 30 tracks in any order; skip forward; skip back; fast forward; fast reverse; cancel; repeat disc, track, and program; 16-function remote control; three-beam laser; analog filtering; single D/A converter. Cues by track number. Sound audible during fast scans. Displays current track number, elapsed time of current track, program in memory. 16.81" W × 4.12" H × 13.36" D; 17 lbs ..... \$500



Mitsubishi DP-409 Multi-Disc Player

**PARASOUND****CDD 940 CD Player/Cassette Deck**

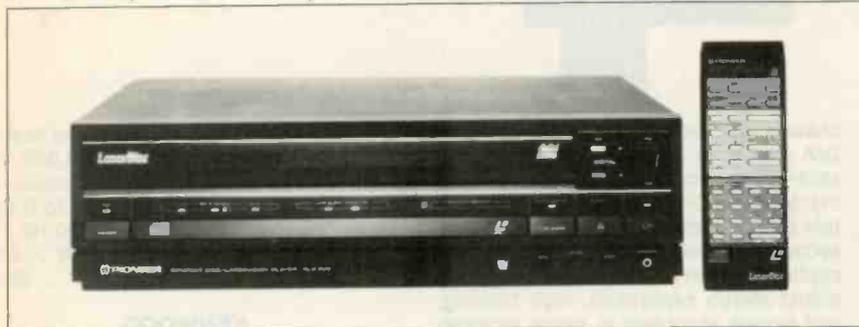
Combination Compact Disc player and cassette deck in one unit. CD section: drawer loading; skip forward; skip back; fast forward; fast reverse; repeat disc,

frequency response 5-20,000 Hz  $\pm$ 0.5 dB; 34 lbs, 7 Oz, 16.56" W x 6.62" H x 17.62" D ..... \$1,200

**CLD-909—Featured on Cover**

Features semiautomatic front loading; programming of 10 CD tracks and 10 LD

ward/reverse; cancel; repeat track, disc, phrase, program; remote control; single D/A converter; headphone jack with adjustable level; 3-beam laser. Cues by track/index number. Displays current track number, elapsed time of current track and disc, remaining time on disc, program in memory. Audible scans ..... \$800  
XA-10. 10-disc magazine ..... \$20 ea



Pioneer CLD-909 CD/LD Player

track; headphone jack; 3-beam laser; multiple digital filtering; gentle analog filtering; single D/A converter; sound audible during fast scan. Cues by track number. Samples at 44.1 kHz. Displays current track number, elapsed time of current track, elapsed time on disc, remaining time on disc. Cassette section: 2 heads; 2 motors; Dolby B & C; Dolby HX Pro; elapsed-time counter; LED meters; soft-touch controls; headphone jack; electronic counter; Sendust head. W&F 0.07% WRMS; FR ( $\pm$ 3 dB) ferric 20-16,000 Hz, high bias 20-17,000 Hz; metal 20-18,500 Hz; S/N (A-wtd) ferric 65 dB Dolby B, 75 dB Dolby C, high bias 67 dB Dolby B, 77 dB Dolby C, metal 67 dB Dolby B, 77 dB Dolby C. 17.25" W X 3.75" H X 10" D; 16 lbs ..... \$500

**PIONEER ELECTRONICS****CLD-900 Compact Disc/LaserDisc Player**

Drawer-loading player for Compact Discs and LaserVision videodiscs. Features 3-beam laser; programming of 1 track; sound audible during fast forward and fast reverse; skip forward; skip back; fast forward; fast reverse; repeat track, disc, phrase; remote control; headphone jack with adjustable level. Displays current track number, elapsed time of current track, remaining time on disc. Cues by track number, index number, time; 6 separate servo systems including tilt servo to compensate for warped discs; 83-mm disc damper for added playback stability. Total harmonic distortion at 1,000 Hz 0.003% at -0 dB; signal-to-noise ratio 96 dB; sep 94 dB;

chapters; high-resolution video reproduction; CD subcode output; on-screen display; remote control of CX NR . \$900

**PD-M6(BK) Multi-Play CD Player**

Multi-disc player holds up to 6 CDs. Features wireless remote control; random access programming of 32 tracks from up to 6 discs; skip forward; skip back; fast forward; fast reverse; pause; cancel; random play for continuous shuffle play

**TEAC****AD-7 CD Player/Cassette Deck**

Combination CD player and cassette deck. CD section: drawer loading; programming of 15 tracks in any order; independent output for CD; auto space; random programming dubbing from CD to tape; skip forward/back; fast forward/reverse; repeat track, disc, program; 15-function remote control; 3-beam laser; single D/A converter; headphone jack with adjustable level. Cues by track/index number. Displays current track, elapsed time of current track. Audible fast scans. Cassette: full IC-logic 3-motor rotary head; auto-reverse record and playback; Dolby B, C, dbx; memory playback ..... \$999

**TECHNICS****SL-P16 50-Disc Compact Disc Player**

Magazine-loading CD player holds and has access to up to 50 CDs. Can play



Teac AD-7 CD/Cassette Player

from 6 discs. Repeats all 6 discs, single disc, program, track. Displays disc number, track number, elapsed time on disc, total playing time on disc, program in memory. Includes 6-disc and single-disc magazine ..... \$500

**SONY****CDP-C10 Multi-Disc CD Player**

Drawer-loading CD player with ten-disc magazine. Features programming of 20 tracks in any order, 99 in sequential order; skip forward and back; fast for-

any track of any disc in any order or all 50 discs in continuous sequence beginning at disc 1 to end of disc 50 for about 60 hours of continuous music. Can add up to 4 additional units for a maximum 250-disc capacity. Features skip forward; skip back; fast forward; fast reverse; cancel; repeat track, disc, program; 14-function remote control; 3-beam laser; analog filtering; single D/A converter; headphone jack with adjustable level. Cues by track number, index number, time. Samples at 44.1 kHz; displays current track number, elapsed time of current track and disc, program in memory; remaining time on disc \$4,000  
**SL-P16U.** Enables access and use of 50 CDs to SL-P16 ..... \$3,500

**TOSHIBA****XR-V22 Compact Disc Player**

Double-drawer-loading CD player plays 2 discs. Features 3-beam laser; fast forward/reverse; programming of 30 tracks in any order; repeat disc. Displays current track number, elapsed time of current track and disc ..... \$550



Sony CDP-C10 Home DiscJockey

# CAR CD PLAYERS

## ALPINE

### 7900 CD Tuner

Compact Disc player with AM/FM tuner. Features volume control; balance control; bass control; treble control; skip forward; skip back; fast forward; fast reverse; pause; preamp outputs; dual preamp outputs; auto scan. FR 5-20,000 Hz  $\pm 1$  dB; S/N A-wtd 90 dB referred to 0 dB; THD at 1,000 Hz 0.005% referred to -20 dB; ch sep 85 dB at 1,000 Hz, 60 dB at 10,000 Hz ..... \$850

### 5900 CD Player

Compact Disc player with track/time display. Features volume control; balance control; bass control; treble control; skip forward; skip back; fast forward; fast re-



Alpine 7900 ETR/PLL FM/AM Tuner CD Player

verse; pause; preamp outputs; disc repeat; auto disc initializer; power loading; line input with noise suppressor. FR 5-20,000 Hz  $\pm 1$  dB; S/N A-wtd 90 dB referred to 0 dB; THD at 1,000 Hz 0.005% referred to -20 dB; ch sep 80 dB at 1,000 Hz, 60 dB at 10,000 Hz .... \$650

## BLAUPUNKT

### CDP-05 Compact Disc Player

Car CD player that operates with low- or high-level inputs. Features volume, balance, bass, and treble controls; skip forward; skip back; fast forward; fast reverse; pause; preamp outputs; 3-beam laser; automatic cartridge loading; floating shock-resistant disc drive; radio override. Optional fader control. FR 18-20,000 Hz  $\pm 3$  dB; W&F unmeasurable; S/N (A-wtd) 89 dB referred to 0 dB; THD 0.15% referred to 0-30 dB; ch sep 70 dB at 10,000 Hz. 2" H X 7" W X 6.25" D; 3.36 lbs ..... \$550

## DENON

### DCC-8900 Car AM/FM/CD Unit

DIN-E-sized AM/FM radio and Compact Disc player with theft-proof slide-out

chassis. CD section features super liner D/A converter; 3-beam laser; thermal shut-down circuit to prevent overheating; built-in DC-to-DC converter to maintain steady current supply. AM/FM tuner section features Denon Optimum Reception System (DORS) to automatically adjust stereo separation, high filtering, and muting according to signal strength of incoming FM stations; quartz-frequency tuning; 18 FM/6 AM station presets; scan function. Preamp section features tone controls ..... \$900

## FORD/JBL

### Ford Compact Disc Player

Direct-loading car CD player. Features automatic music search; music scan; re-

peat disc/track; digital LED display. FR 5-20,000Hz; THD <0.05%; dynamic range >90dB; S/N >90dB. CD player is only available as a dealer-installed accessory to 1987 Lincoln Town Cars equipped with Ford/JBL audio system. .... \$600-\$800

## FUJITSU TEN

### SD-1110 Compact Disc

Compact Disc player with emergency eject system. Features skip forward; skip back; fast forward; fast reverse; disc repeat; 3-beam laser; digital filtering; music

scan; track number and play-time indicator. Frequency response 5-20,000 Hz  $\pm 1$  dB; W&F 0.001%; signal-to-noise ratio (A-weighted) 90 dB referred to 0 dB; total harmonic distortion at 1,000 Hz 1% referred to -20 dB. 7" H X 2" W X 6.5" D ..... \$550

## KENWOOD

### KDC-9 Compact Disc Player

Automobile Compact Disc player with electronic volume control. Features balance control; bass control; treble control; fader control for front and rear speakers; skip forward; skip back; fast forward; fast reverse; pause; return; preamp outputs; repeat track and disc; repeat clear function; eject button; 3-beam laser; dual amp balancer (fader); LED volume display; 20 dB attenuator; auto loading. Frequency response 5-20,000 Hz  $\pm 1$  dB; W&F below measurable limit; signal-to-noise ratio (A-weighted) 90 dB referred to 0 dB; total harmonic distortion at 1,000 Hz 0.005% referred to -20 dB. 4 lbs; 7.06" H X 1.94" W X 5.15" D .... \$659

## MITSUBISHI

### CD-100 Compact Disc Player

2-piece CD player with full computer logic; sequential operation; auto-slot-disc loading; full-program repeat; 1-program repeat; fast forward reverse; fast forward and reverse program skip; program scanning; total number program readout; multicolor LCD; thermal protection for laser diode; internal condensation protection. Dash unit 2" H x 7" W x 6.36" D.

**System 1.** CD player in 50-W system with CV-231 equalizer amp (see section 6) and a choice from a range of speakers depending on car ... \$600-\$700/system  
**System 2.** CD player in 100-W system with RX-741 electronic AM/FM cassette radio, power amp, and a choice from a range of speakers depending on car. Cassette radio has quartz-PLL synthesizer; 5 AM/5 FM presets; electronic



Kenwood KDC-9 Car CD Player

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 <p><b>Aiwa ADF350</b> 2-motor, Bias Tuning</p> <p>\$119 Dolby B+C</p>	 <p><b>Sansui PL-95RB</b> Front-Load Linear Tracker</p> <p>★\$199★ Auto-Reverse</p>	 <p><b>3bx x DS</b> Dynamic Range Expander</p> <p>CALL SPECIAL</p>	 <p><b>Toshiba XRV22</b> Dual Disc Player</p> <p>\$269</p>
 <p><b>Aiwa ADR450</b> Auto-Reverse, 2-Motor</p> <p>\$149 Dolby B+C</p>	 <p><b>Akai AAV401</b> Digital, 80 watts/ch, Video Inputs</p> <p>\$199</p>	 <p><b>Sansui SE88</b> 14 Band EQ, 5 Presets</p> <p>★\$269★ Wireless</p>	 <p><b>Sherwood CRD165</b> Auto-Reverse, 12 Presets</p> <p>\$119 Digital</p>
 <p><b>TEAC W440C</b> Dolby B+C, High Speed Dubbing</p> <p>\$169</p>	 <p><b>Technics SA590</b> 100 watt/ch</p> <p>\$329 Wireless</p>	 <p><b>TEAC Disc Player</b> 15 Track, Programmable</p> <p>\$149 3-Beam</p>	 <p><b>Jensen Digital</b> Auto-Reverse, Fader</p> <p>\$139 CD Input</p>
 <p><b>JVC KDV6 3-Head</b> Dolby B+C, 2-Motor</p> <p>\$199</p>	 <p><b>Sansui SXV1000</b> 80 wt/ch Best Audio/Video Receiver</p> <p>★\$349★ Wireless</p>	 <p><b>Sony D-14</b> Portable Disc Man</p> <p>\$159 w/Battery Pack</p>	 <p><b>Sherwood CRD301</b> Digital, Dolby, Auto-Reverse</p> <p>\$149</p>
 <p><b>Sansui D-905</b> 3-Head, Auto Reverse, Dolby B+C</p> <p>★\$299★ Best Buy</p>	 <p><b>Kenwood KVRA95RB</b> 100 watts/ch, 7-band EQ</p> <p>CALL Wireless</p>	 <p><b>Hitachi Disc Player</b> 3-Beam, 15-Track</p> <p>\$219 Wireless</p>	 <p><b>Concord HPL520</b> Dolby B+C, Digital</p> <p>\$229</p>
 <p><b>TEAC V850X</b> 3-Head, 3-Motor, Dolby B+C+dbx</p> <p>\$339 w/Remote</p>	 <p><b>Integrated Amp &amp; Tuner</b> Top of the Line, 20 presets</p> <p>\$369 150 watt/ch</p>	 <p><b>Technics SLP300</b> Wireless Remote</p> <p>\$219</p>	 <p><b>Concord HPL550</b> Top of the Line</p> <p>CALL LOADED</p>
 <p><b>TEAC R888</b> 3-Head, 3-Motor, Dolby B+C+dbx</p> <p>\$399 Auto Reverse</p>	<h3>Reasons Why WDS Rated #1:</h3> <ul style="list-style-type: none"> <li>*All Orders Processed within 12 Hours.</li> <li>*95% of All Orders Shipped Within 48 Hours.</li> <li>*All Units Factory Sealed With Full Warranty.</li> <li>*No Extra Charge for Mastercard or Visa.</li> <li>*We Can Ship Complete COD (Only \$2.00 Extra).</li> <li>*Buyer Protection Plan Included With Every Item — Free.</li> <li>*7-Day Service Guaranteed</li> <li>*No Extra Hidden Charges</li> <li>*No Inflated Shipping Charges</li> <li>*Established 1954 — Our Sales Representatives Have Over 5 Years of Training.</li> <li>*Extended Warranties Available</li> </ul>		 <p><b>Sony G-7W</b> Complete Midi System</p> <p>\$299</p>
 <p><b>Pioneer Combination CD/Laser vision</b></p> <p>\$569 Wireless</p>			 <p><b>Sansui CP99 Portable</b> Top of the Line</p> <p>\$299 Dubbing</p>
 <p><b>"The Tower"</b> by Sansui \$109 ea. 160 watt/speaker</p>			 <p><b>Proton Clock Radio</b></p> <p>CALL</p>
 <p><b>EPI 3-Way Floor-Standing</b></p> <p>\$88 ea.</p>			 <p><b>KOSS JCK200S</b> Headphones</p> <p>\$119 Wireless</p>

SOME ITEMS CLOSEOUTS.  
SOME LIMITED QUANTITIES.

memory; auto seek/scan; step-touch tuning; power output 7 W RMS max into 4 ohms; auto reverse with tape direction indicators; locking fast-forward and rewind; metal/chrome equalization; music program sensor; pinch-off tape protection; Dolby B; loudness, fader, and balance controls; separate bass and treble controls; night illumination; digital frequency display; power antenna lead; Stereo Reception Control; preamp outputs. 2.12" H x 7" W x 5.5" D. Amp with package is CV-251, 4-channel amplifier with 25 W/ch . . . . \$900-\$1,000/system

### PANASONIC

#### CQ-E800 Compact Disc Player

Random-access programmable CD player with AM/FM tuner. Includes AM tuner; FM tuner; volume control; balance control; bass control; treble control; skip forward; skip back; fast forward; fast reverse; pause; preamp outputs; disc repeat; single-beam laser; ch-blend circuit; disc scan; tuner on/off; auto-load disc; 5 selections; 12 FM presets; 6 AM presets. CD section: FR 5-20,000 Hz; S/N (A-wtd) 90 dB ref to 0 dB; THD at 1,000 Hz 0.005% ref to -20 dB. Tuner section: FM stereo 50-dB quieting sens 15.2 dBf; alt-ch sel 75 dB; capture ratio 1.5 dB at 65 dBf; FM S/N at 65 dBf 70 dB. 1" H x 7" W x 5.12" D . . . . \$700

for elapsed play time, total play time, remaining time; full illumination. CD section specs: FR 5-20,000 Hz  $\pm 1$  dB; W&F unmeasurable; S/N (A-wtd) 90 dB referred to 0 dB; THD at 1,000 Hz 0.005% referred to -20 dB. Total weight 8.4 lb; main unit dimensions: 2" H x 7.12" W x 5.88" D; secondary unit dimensions: 2" H x 7.12" W x 6.5" D . . . . . \$550

#### DEX-77 AM/FM Compact Disc Player

AM/FM CD player with Supertuner III. Tuner features 24 station presets (18 FM and 6 AM); Best station memory selects and stores stations by signal strength. CD section features 3-beam pickup; wired remote control for track scan; auto power loading system; random play function; repeat all/track; secret code anti-theft system. . . . . \$800

### PHILIPS AUTO AUDIO

#### DCO 85 Removable CD Player

In-dash DIN chassis Compact Disc player also for portable and home use. Includes volume control; balance control; bass control; treble control; skip forward; skip back; fast forward; fast reverse; pause; preamp outputs; disc repeat; digital filtering; portable with battery pack. FR 20-20,000 Hz  $\pm 0.5$  dB; W&F below measureable limits; S/N (A-wtd) > 90 dB ref to 0 dB; THD at 1,000 Hz 0.008% ref

ref to 0 dB; THD at 1,000 Hz > 0.008% ref to -20 dB; sep > 90 dB at 1,000 Hz, > 90 dB at 10,000 Hz, > 90 dB at 20,000 Hz. 180 mm H x 51 W x 149 D . . \$400

### SANSUI

#### CD-X500 Car Compact Disc Player

Slot-in disc-loading CD player with 3-beam laser. Features programming of 16 tracks in any order; automatic music search; automatic repeat play; introskip; skip forward; skip back; fast forward; fast reverse. Displays current track, running time, and mode . . . . . \$599

### SANYO

#### FTEC2 AM/FM Stereo CD Player

AM/FM stereo Compact Disc player for use with an outboard amp. Features AM/FM tuner; volume, balance, bass, treble, loudness controls; skip forward; skip back; fast forward; fast reverse; pause; preamp outputs; disc repeat; 3-beam laser; display LCD; PLL-synthesizer; 12 FM/6 AM presets; seek; scan; local/DX switch; stereo/mono; search; intro scan; 16-track programmability; endless play; fader; stand by; power antenna jack; lead sportster jack; Viper security system. CD section specs: FR 5-20,000 Hz; S/N (A-wtd) 90 dB referred to 0 dB; THD at 1,000 Hz 0.005% referred to -20 dB; ch sep 80 dB at 1,000 Hz. Tuner section specs: FM stereo 30-dB quieting sens 19.2 dBf; capture ratio 2 dB at 65 dBf; sep at 1,000 Hz 35 dB at 65 dBf. Bass control boosts or cuts 10 dB at 100 Hz; treble control boosts or cuts 10 dB at 100 Hz. Main unit dimensions 178 mm H x 25 W x 130 D, DC converter 120 mm H x 35 W x 24 D . . . . . \$700

#### FTEC1 AM/FM Stereo CD Player

AM/FM stereo Compact Disc player for use with an outboard amp. Features AM/FM tuner; volume, balance, bass, treble, loudness controls; skip forward; pause; preamp outputs; disc repeat; 3-beam laser; display LCD; PLL-synthesizer; 6 FM/6 AM presets; scan; local/DX switch; stereo/mono; intro scan; fader; stand by; power antenna jack; lead sportster jack. CD section specs: FR 5-20,000 Hz; S/N (A-wtd) 90 dB referred to 0 dB; THD at 1,000 Hz 0.005% referred to -20 dB; ch sep 80 dB at 1,000 Hz. Tuner section specs: FM stereo 30-dB quieting sens 19.2 dBf; capture ratio 2 dB at 65 dBf; sep at 1,000 Hz 35 dB at 65



Pioneer DEX-77 AM/FM CD player

### PIONEER

#### CDX-P1 Compact Disc Player

Compact Disc player with DIN chassis; control amp; electronic control module. Features volume control; balance control; bass control; treble control; skip forward; fast forward; fast reverse; pause; preamp outputs; disc repeat; fluorescent display for elapsed play time, total play time, remaining time; full illumination. CD section specs: FR 10-20,000 Hz  $\pm 2.0$  dB; W&F unmeasurable; S/N (A-wtd) 90 dB referred to 0 dB; THD at 1,000 Hz 0.005% referred to -20 dB. Bass control boosts or cuts 10 dB at 100 Hz; treble control boosts or cuts 10 dB at 10,000 Hz. Total weight 8.4 lb; main unit dimensions: 2" H x 7.12" W x 6.5" D; secondary unit dimensions: 2" H x 7.12" W x 6.5" D . . . . . \$600

#### CDX-1 Compact Disc Player

Compact Disc player with DIN chassis; electronic control module. Features skip forward; fast forward; fast reverse; pause; disc repeat; fluorescent display

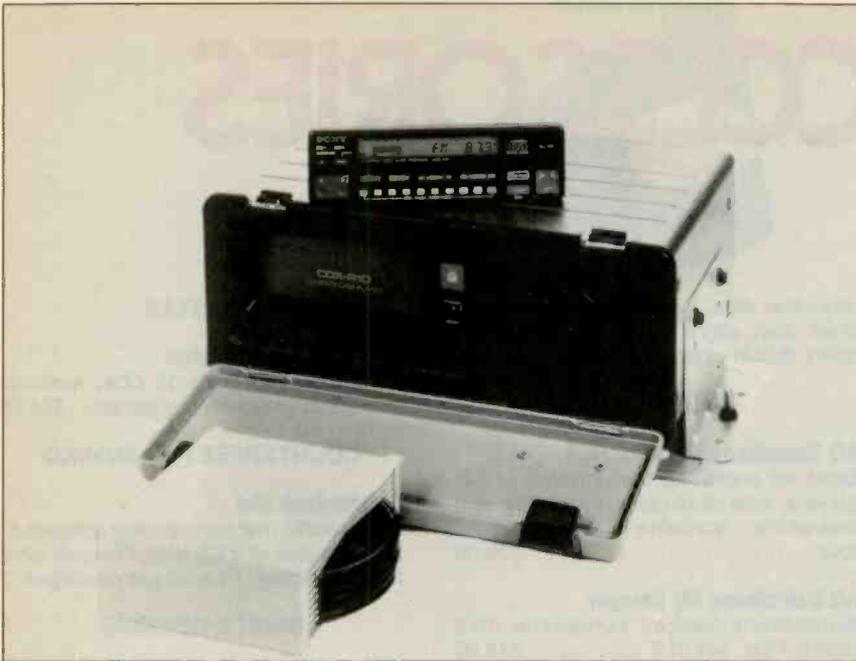
to -20 dB; sep 90 dB at 1,000 Hz, 0 dB at 10,000 Hz. 180 mm H x 51 W x 149 D . . . . . \$550

#### CD10 Portable Car CD Player

DIN box unit with a retractable automotive tray. Includes volume control; balance control; bass control; treble control; skip forward; skip back; fast forward; fast reverse; pause; preamp outputs; disc repeat; digital filtering. FR 20-20,000 Hz  $\pm 0.5$  dB; W&F 0%; S/N (A-wtd) 90 dB



Sansui CD-X500



Sony CDX-A10 Car DiscJockey

dBf. Bass control boosts or cuts 10 dB at 100 Hz; treble control boosts or cuts 10 dB at 10,000 Hz. Main unit dimensions 178 mm H × 50 W × 130 D, tuner 150 mm H × 25 W × 130 D ..... \$600

### SONY

#### CDX-A10 DiscJockey

10-CD player/changer with remote control and optional digital-synthesis AM/FM tuner module. Player/changer designed to be mounted in trunk or rear compartment of vehicle. Outputs connect to 1 or 2 external stereo power amps. All functions controlled by DIN-sized remote commander designed for dash. Features 3-position Dynamic Range Suppressor; switchable Surround Sound circuit; 10-track programmability; Auto Music Sensor; Random Music Sensor. Includes connecting cables and 1 XA-10 disc magazine ..... \$1,000  
 XT-10. Tuner pack ..... \$130  
 XA-10. Disc magazine ..... \$20 ea

#### CDX-R7 Compact Disc Player

Compact Disc player with separate FM/AM tuner module. DIN-E size designed for in-dash mounting; tuner module can be mounted separately. RCA jacks provided for connection to 2 external amps for front and rear control. Features balance control; bass control; treble control; skip and search in forward and reverse modes; pause; four preamp outputs; 3-beam laser; fader; digital clock; 18 presets; stereo/mono switch; auto loading. CD section specs: FR 5-20,000 Hz ± 2 dB; W&F not measurable; S/N (A-wtd) > 90 dB ref to 0 dB; THD at 1,000 Hz 0.005% ref to -20 dB; ch sep > 85 dB at 1,000 Hz; bass control boosts or cuts 10 dB at 100 Hz; treble control boosts or cuts 10 dB at 10,000 Hz. Tuner section: FM FR 20-15,000 Hz ± 2 dB; FM stereo 50-dB quieting sens 15.3 dBf (1.6 μV); alt ch sel 70 dB at 400,000 Hz; cap-

ture ratio 1.5 dB at 65 dBf; sep at 1,000 Hz 42 dB at 65 dBf. Total weight 5.8 lb with tuner module; main unit dimensions: 178 mm H × 50 W × 155 D; secondary unit dimensions: 178 H × 25 W × 135 D ..... \$700

#### CDX-5 Compact Disc Player

Compact Disc player. DIN-E size designed for in-dash or under-dash mounting. Remote control turn-on and preamp input capabilities enable it to be used in line with an existing tuner/cassette deck. RCA jacks for preamp in/out connections. Features volume control; balance control; bass control; treble control; skip forward; skip back; fast forward; re-

verse; pause; preamp inputs and outputs; 3-beam laser. CD section specs: FR 5-20,000 Hz ± 1 dB; W&F not measurable; S/N (A-wtd) > 90 dB ref to 0 dB; THD at 1,000 Hz 0.005% ref to -20 dB; ch sep greater than 85 dB at 1,000 Hz; bass control boosts or cuts 10 dB at 100 Hz; treble control boosts or cuts 10 dB at 10,000 Hz. Total weight 4 lb; 178 mm H × 50 W × 155 D ..... \$600

### TECHNICS

#### CQ-DP5 Compact Disc Tuner

Compact Disc player tuner with outboard DC/DC converter and tuner section. Includes AM tuner; FM tuner; volume control; balance control; bass control; treble control; loudness control; skip forward; skip back; fast forward; fast reverse; pause; preamp outputs; speaker outputs; disc repeat; FFI single-beam laser; 12 FM presets, 6 AM presets; 15 step RAM programming. CD section: FR 5-20,000 Hz; W&F unmeasurable; S/N (A-wtd) 90 dB ref to 0 dB; THD at 1,000 Hz 0.005% ref to -20 dB. Tuner section: FM FR 20-15,000 Hz ± 3 dB; FM S/N at 65 dBf 70 dB; main unit: 7" H × 2.06" W × 5.88" D; secondary unit: 7" H × 1" W × 5.12" D ..... \$700

### YAMAHA

#### YCD-1000 CD Player—Featured on Cover

Compact Disc player with unique disc loading system. Features volume control; bass control; treble control; skip forward; skip back; fast forward; fast reverse; pause; preamp outputs; disc repeat; three-beam laser; digital filtering. CD section: FR 5-20,000 Hz ± 0.5 dB; W&F 0%; S/N (A-wtd) 100 dB ref to 0 dB; THD at 1,000 Hz < 0.0015% ref to -20 dB; ch sep > 90 dB at 1,000 Hz. 2" H × 7.06" W × 6.25" D ..... \$549



Yamaha YCD-1000 Car CD Player with CD cartridge

## PRICES LISTED

are only the manufacturers' suggested retail prices  
 (also referred to as *list prices*):  
 actual selling prices are set by each dealer.  
 All prices are subject to change without notice.

# CD ACCESSORIES

## APATURE by ACR

### Gold Interconnect Cables

High-resolution professional audio and video patch cords. For use with all video, CD, VHS, Beta formats; all audio components. Length: 1 meter . . . . . \$18 ea  
 .5 meter chrome cable . . . . . \$20 each  
 2-meter chrome cable . . . . . \$24 each  
**Premium Gold Interconnect Cables.** Same as chrome cables except with 5 micron gold ends . . . . . \$30 ea

## ADS

### B3 Storage Module

Storage module with tambour door and vertical dividers. Stackable; length and width matches measurements of Atelier components; useful for storing cassettes, CDs, LPs. Available in black or white . . . . . \$150.00

**B4.** Similar to B3 except open front with adjustable shelf . . . . . \$100.00

## ALLSOP

### 59000 Rotary CD Cleaning Device

Hand-operated wet-system Compact Disc cleaner using soft, replaceable pad to clean from center to edge of disc. Gear drive automatically rotates disc while cleaning pad is being turned \$29.95

## AUDIOSOURCE

### LLC-1 CD Laser Lens Cleaner

Digitally encoded Compact Disc with built-in, man-made carbon-fiber impregnated cleaning brush to clean harmful residues and particles from the laser lens of CD players. Inserts into CD player like

any other disc. Inaudible test tone positions disc, aligns brush and lens, and spins disc in circular motion . . . \$26.95

## AUDIOQUEST

### AQ Sorbothane Isolation Foot

Used for improving performance of CD players, tube electronics, turntables, and televisions. Sorbothane disc. Set of four . . . . . \$39.00

### AQ Sorbothane CD Damper

Sorbothane-backed composite disc damps CDs. Set of 2 . . . . . \$15.00

## BIB

### A-607 CD Cleaning System

Compact Disc tray, cleaning unit, fluid, and brush . . . . . \$14.95

### A-611 CD Storage Module

Strong practical CD storage unit holds up to 10 CDs in their jewel boxes. Fingertip touch release system automatically ejects selected CD for easy removal. Interlocking modules can be expanded vertically or horizontally. Molded of strong ABS plastic. Wall or shelf mounting . . . . . \$4.59

## BOLIT by LaGORIO IMPORTS

### Bolit Gold Polish and Protector

For use on plastic sound-equipment cases, turntable covers, and Compact Discs. Restores laser readability to CDs while reducing dust accumulation. Helps to reduce and/or eliminate skips, clicks etc. due to scratches on CD surface. 1-oz bottle . . . . . \$5.95

## COASTAR

### Compact Disc Organizer

Portable carrier holds 15 CDs. Available in black or grey with red accent . . \$24.95

## COUNTERFEET by SUMIKO

### CD Interface Mat

Clear plastic mat permanently adheres to the label side of a CD disc. Protects label from scratches. 10 mats per package \$10

## DASH II DESIGNS

### Model 4010 Tall Turntable

CD storage furniture rotates to reveal 4 vertical rows of 40 cloth-covered storage slots. 11.5" W x 30" H x 11.5" D; 30 lbs. Oak finish . . . . . \$185.00  
 Walnut finish . . . . . \$225.00

### Model 2830 Full Module CD Storage Unit

CD storage furniture with 5 vertical rows of cloth-covered storage slots. Stackable modules each holding up to 200 CDs. 30" W x 30" H x 5.5" D; 40 lbs. Oak finish . . . . . \$158.00  
 Walnut finish . . . . . \$188.00

### Model 4000 Small Turntable

CD storage furniture rotates to reveal 4 vertical rows of 20 cloth-covered storage slots. 11.5" W x 16" H x 11.5" D; 20 lbs. Oak finish . . . . . \$140.00  
 Walnut finish . . . . . \$165.00

### Model 2835 Half Module CD Storage Unit

CD storage furniture with 5 vertical rows of cloth-covered storage slots. Stackable modules each holding up to 100 CDs. 30" W x 16" H x 5.5" D; 25 lbs. Oak finish . . . . . \$89.00  
 Walnut finish . . . . . \$108.00

### Model 2810 Single Tower

Features 40 cloth-covered storage slots and detachable predrilled base. Can be placed upright in base or on its side. 6.5" W x 30" H x 5.5" D; 12 lbs. Oak finish . . . . . \$76.00  
 Walnut finish . . . . . \$90.00

### Model 2820 Mini Module

Stackable CD storage unit with cloth-covered slots to hold up to 20 CDs. Vertical or horizontal storage. 6" W x 16" H x 5.5" D; 7 lbs. Oak finish . . . . . \$45.00  
 Walnut finish . . . . . \$58.00

## D.G. INDUSTRIES

### Compact Disc Storage

Stackable plexiglass tray stores 29 CDs. Tilts CDs for easy reading . \$29.95



AudioSource LLC-1 CD Lens Cleaner

**DISCWASHER****Discwasher Compact Disc Cleaner**

Includes a CD cleaning unit, CD-1 cleaning fluid, cleaning pad grooming brush and replacement cleaning pad. 14 oz; 6.75" W x 5.25" H x 1.25" D ... \$19.95

**CD Storage System**

Lightweight, durable unit stores up to 20 CDs in their jewel boxes. Designed to allow user to "flip" through CDs stored in unit. Can be wall mounted. 6" W X 2" H X 14.75" D ... \$19.95

**DYNASOUND ORGANIZER****Sound Sender**

Adaptor plugs it into car's cigarette lighter to play portable Compact Disc players through car radio's FM sound system. \$30.00

**FINAL DESIGN****Nulli Secundus CD Storage Unit**

Handcrafted hand-oiled waxed-hardwood storage unit holds up to 40 Compact Discs. Features polished-bronze glass doors with machine-carved finger

staggered formation for easy access, quick viewing, and condensed storage.

**CDSA.** Self-adhesive base for mounting to clean, flat surface. 10.25" long X 6" W X 6.36" H with CDs ... \$7.95

**CDSM.** Slide-mounted version with ball-bearing slides ... \$19.95

**GENEVA GROUP****PF-400 CD Storage Album**

LP-size storage unit for CDs. Accommodates 4 CDs in clear-plastic carrying case. 12 ozs ... \$7.99

**PF-410 Compact Disc Cleaner**

Easy-to-use premoistened cleaning pads cleans at least 5 Compact Discs each. Features 18 premoistened cleaning pads. 3 ozs ... \$7.99

**INNOVATIVE CONCEPTS****Flip 'N' Play Compact Disc File 18**

Plastic storage rack with touch-release mechanism holds to store up to 18 Compact Discs vertically. Racks may be stacked ... \$7.95

**Flip 'N' Play Compact Disc File 10.** As above except holds 10 CDs ... \$4.95

polystyrene. Available in 4 colors (red, black, grey, and white). 5" W X 1" H 6" D ... \$2.99/set

**LASERLINE BY CREATIVE POINT****CD-2400 Compact Disc Storage Unit**

Compact Disc storage unit holds up to 24 Compact Discs. Includes Securing Release Mechanism (SRM) to secure disc in slot and release disc cartridge at a touch. Constructed from impact-resistant, high-grade plastic. Modular design for adding additional units. 18.66" W X 4.9" H X 6.75" D ... \$29.95

**CD-1200.** Same as CD-2400 except holds up to 12 CDs. 12.6" W X 3.95" H X 6.75" D; 2.15 lbs ... \$19.95

**CD-800.** Same as CD-2400 except holds up to 8 Compact Discs. 6.4" W X 4.9" H X 6.75" D ... \$9.95

**MEMOREX BY MEMTEK****Compact Disc Cleaner**

Cleans digital Compact Discs for accurate music reproduction. Restores uniform disc reflectivity. Includes cleaning solution, pad, bristle brush, and storage case ... \$14.99

**Compact Disc Player Dustcover**

Soft durable vinyl CD player dustcover with clear front panel for convenient viewing of controls. Available in medium (14" X 12.5" X 3") and large (18" X 14" X 3") sizes ... \$5.99

**Compact Disc Organizer**

Storage unit with independent storage slots holds up to 12 CDs in a vertical position. Twin pack ... \$4.99

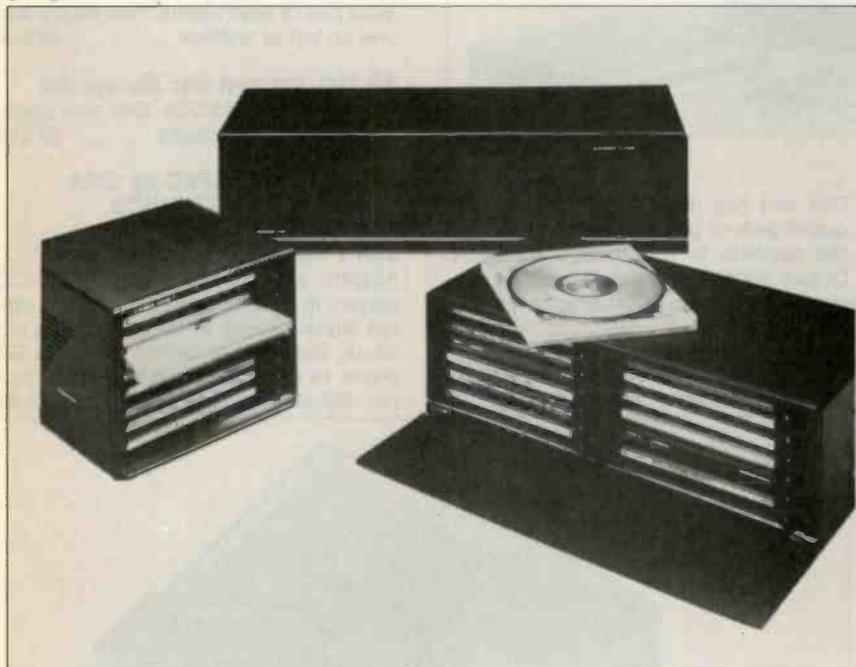
**Compact Disc Storage Case**

High-quality dust-proof replacement storage case for individual Compact Discs. Standard jewel-box size and design. Twin pack ... \$2.99

**MICROLAND FURNITURE****Rolltop-Box CD Storage Unit**

Solid-oak rolltop box for CD storage. Rolltop tambour curtains assembled with individual of solid oak on a canvas backing. Boxes held together with tongue-and-groove joints. Dark-oak stained finish with a durable clear lacquer sealer and 4 nonskid protective pads on the bottom. Available in single-row model to store up to 16 CDs. Available by phone or mail order. \$6.95 shipping & handling charges ... \$39.95  
Optional solid-brass name plate for placement on storage unit ... \$9.95

These listings are based on data provided by the manufacturers. For more product information, contact an authorized dealer or the manufacturer directly. Manufacturers' addresses are given in the directory beginning on page 147.



Laserline CD-2400, -1200, and -800

pulls; precision-ground ball-bearing drawer. Natural or medium oak. 8.36" H X 12.25" D X 12.25" W; approx 15 lbs ... \$149.95

**Audiophile Compact Disc Travel Case**

Durable tote bag designed to carry up to 20 CDs. Features laminated foam interior for cushioned protection; dual-zipper access flap; detachable adjustable shoulder strap; offset plastic base tray holds discs upright. Available in assorted colors. 10.5" long X 6" W X 6.5" H. \$15.95

**Compact Disc Collators**

Organizational trays for storing Compact Discs. Stores up to 20 CDs in upright

**JOOK-BOX****ADSC 01 Album/CD/Cassette Storage**

Modular storage system allows storage of all type of audio/video software in one unit. Holds up to 75 albums, or up to 90 cassettes with snap-in cassette rack, or up to 56 CDs with adapter, or up to up to 30 VHS/Beta video tapes. Constructed of high-impact polystyrene in 4 colors (red, black, grey, white) ... \$9.95

**CR 01 CD/Cassette Storage Unit**

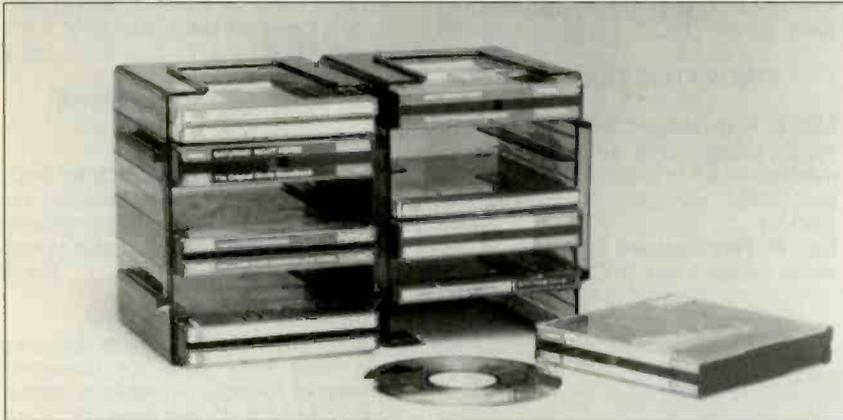
2 units snap into CDA 01 cassette storage to hold up to 7 CDs or 7 unboxed cassettes. Constructed of high-impact

**MONSTER CABLE****Interlink CD Cable**

Interconnect cable for Compact Disc players for increased performance and sound quality. .... \$3.00/ft  
 1 meter pr ..... \$50.00  
 2 meter pr ..... \$70.00  
 20 ft pr ..... \$150.00

**Discus Compact Disc Stabilizer**

A black anodized aluminum disc placed on top of a CD while it is played. Designed to damp out CD vibration, minimize laser diffraction and stabilize speed, resulting in tighter more dynamic bass, faster transients, more focused imaging and improved depth. .... \$29.95



SAC CDDS-1 Compact Disc Organizer

**Discus + Compact Disc Stabilizer.** Same as Discus, but made of black finished brass to do an even better job of stabilizing the disc in those players that can handle its higher mass. .... \$39.95

**NAGAOKA**  
 by **ANGSTROM ASSOCIATES**

**CD-1100K CD Cleaning System**

Radial Compact Disc cleaning system. Spray acts as a surface lubricant to form a buffer between dirt and disc surface. Lamb-leather cleaning pad lifts dirt from fluid layer and absorbs it in center. Features hand-held design and includes grooming brush ..... \$19.95

**CD-321 Flexi Keeper**

Spring-loaded open Compact Disc storage system designed to securely hold and display upright up to 15 CDs. Can also be used to store audio cassettes and video cassettes ..... \$14.95

**CD Safe-T-Case**

Jewel-box-type CD case with soft grooved unbreakable polypropylene bottom to keep dust away from CD. Features hard styrene hinged top for easy opening and access to Compact Discs. 35% thinner than standard Compact Disc jewel boxes ..... \$4.95

**CD Protective Sleeves**

Protective CD sleeves made of nonabrasive anti-static polymer reduce finger prints and dust build-up. Prevents scratches. Pack of 25 ..... \$9.95

**ORTOFON**

**CD-040 Compact Disc Maintenance Kit**  
 Removes dust, dirt, etc. from disc surface to prevent mistracking. Includes padded storage box, cleaning cloth, fluid and lens cleaner ..... \$19.95  
**CD-042 CD Cleaning Spray** ..... \$6.50

**CD-041 Component Isolators**

8 absorbing feet with self-stick backing eliminate vibration on CD players .. \$9.95

**RECOTON****CD-20 Compact Disc Adapter**

Passive adapter cable for playing portable CD player through any cassette deck.

One end has mini plug for headphone output jack of player, other end shaped like cassette to fit into tape transport. Output voltage correctly equalized, designed for no loss in dynamic range, FR, S/N ..... \$24.95

**CD-1 CD Maintenance System**

CD radial cleaner with 100% natural



Signet SK314 CD Cleaning System

chamois, 6 foam applicators, cleaning solution and CD restorer solution \$24.95

**CD-11 CD Radial Cleaner**

Includes 100% natural chamois, 4 foam applicators, cleaning solution .. \$19.95

**SAC****CDDS-1 Compact Disc Organizer**

CD holder which stores both double and single CDs. Can hold up to 6 double or 12 single CDs and can be interlocked horizontally or vertically. Free standing or wall mounted; smoked plastic . \$7.00

**SIGNET**

**SK314.** Auto CD cleaning system. Spins a soft, dry chamois against spinning CD. Cleans for approx 20 seconds and then automatically shuts off. Includes bottle of safe detergent fluid, six optical-quality cloths, and 2 C batteries. .... \$60.00

**SK312.** Compact Disc cleaner. Features soft leather chamols for surface dust and cleaning solution with optical quality cleaning cloths for tougher dirt . \$20.00

**SK481/1.0.** High-definition audio interconnect made with LC-OFC wire. Recommended for CD players ..... \$60.00

**SONRISE****SG-11d Mirrormont III CD Cabinet**

Swiveling cabinet stores up to 40 Compact Discs horizontally, 20 on each side. Solid oak or solid walnut. Can be stacked one on top of another ..... \$76.00

**SG-11dL Compact Disc Storage Unit**

Storage unit for 40 CDs. One side stackable and wall-mountable ..... \$76.00

**STUDIO SPEC by ORA ELECTRONICS****CDA-1 Compact Disc Car Adaptor**

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# DIGITAL DICTIONARY



**Analog:** A physical representation of information that bears an exact relationship to the original information. An analog recording is a physical record of the changing air pressure that sound is. On an LP, the wiggles of the groove correspond to the changing air pressure of the original sound. When you record on tape, the thing that changes is its pattern of magnetism. Because the magnetic pattern on the tape, or the shape of the groove, is *analogous* (similar) to the original sound, this kind of recording is called *analog* recording.

**Analog to Digital (A/D) Converter:** A circuit that changes a continuously varying voltage or current into a digital output. In digital audio the analog signal is converted to a binary output.

**Binary:** A numbering system using a base number of 2. There are two digits (1 and 0) in the binary system.

**Bit:** An abbreviation for a binary digit.

**Burst error:** A common occurrence in digital audio media, a burst error is a large error disrupting hundreds of bits and might be caused by a manufacturing defect or a dust particle on a CD.

**CD-ROM:** Compact Disc Read Only Memory. A CD-ROM is a special

format CD used as a read only memory system for any kind of program material. Currently a CD-ROM stores between 550 and 650 megabytes of data.

**Channel:** An independent signal path. Stereo components have two such channels.

**Channel Separation:** The amount of stereo program material from one channel appearing in the output of the other channel. Expressed in decibels relative to the desired channel output, with values of 20 to 30 dB (the higher figure being preferable) through most of the audible frequency range being typical of good cartridges. Digital equipment has channel-separation specifications usually over 90 dB.

**Compact Disc (CD):** A compact disc is a form of data storage. It has an outer diameter of 120 mm, a center hole 15 mm across, a thickness of 1.2mm., and a weight of about 14 grams. When used to store digital audio information they have a maximum playing time of 74 minutes.

**Cross Interleave Code (CIC):** Error correction using interleaving between even and odd input samples of digital information.

**Cross Interleave Reed-Solomon Code (CIRC):** CIRC is an error correction

system using the Reed-Solomon code in conjunction with interleaved digital samples. It has been adopted for the Compact Disc.

**Cyclic Redundancy Check Code (CRCC):** CRCCs are used for code error detection. It is a mathematical formula used to locate and identify errors in digital information.

**Crossover Network:** A filter which divides a signal into parts and directs the parts to the proper speaker driver. In a three-way speaker, the crossover network sends the low frequencies to a woofer, middle frequencies to a mid-range driver, and high frequencies to a tweeter. Frequencies outside the range of each driver are attenuated at a rate determined by the network design. A crossover frequency is a frequency at which each of two drivers is receiving half the amplifier's power; below or above that point, one speaker will receive more power than the other speaker.

**CX:** A compressor/expander noise-reduction system first introduced by CBS Records for LPs. Capable of 20 dB of noise reduction, it extends the dynamic range of phonograph discs to 80 to 85 dB. To realize this extension, the user must play the record back through a decoder, but the system is designed so that a record played without decoding is quite listenable.

**Damping:** The application of a mechanical resistance, such as a rubber or silicone material, to the cantilever pivot to reduce the amplitude of a resonance.

**dbx:** A noise-reduction system by which the program is compressed before being recorded, and expanded upon playback to restore the original dynamic range.

**Decibel (dB):** A measure of the ratio between two power levels. Doubling or halving the power corresponds to a 3-dB change, and 10-dB corresponds roughly to the audible effect of doubling or halving the *loudness* of a signal (although it represents a power ratio of 10:1).

**Digital to Analog Converter (D/A):** A circuit that changes digital quantities into a voltage.

**Distortion:** An undesired change in the waveform of a signal. With a single-frequency (sine wave) signal, distortion appears as harmonics (multiples) of the input frequency. The rms (effective a.c. point) sum of all harmonic distortion components, is known as *total harmonic distortion*, or THD. When a two-tone test signal is used, distortion components appear at frequencies which are sums and differences of multiples of the input frequencies. Their magnitude is expressed as *intermodulation (IM) distortion*, which is more distressing to hear than THD. Low distortion figures are better than high ones.

**Dither:** Very low-level noise added to a signal being digitized to reduce the high-order distortion caused by quantizing very low-level audio signals. See *quantization*.

**Dolby\*:** Three companding (compressing/expanding) noise-reduction systems developed for tape record-

ing. (Dolby B has also been adapted to FM broadcasting.) Dolby A, the professional version of the system, provides up to 15 dB of noise reduction. Dolby B, the most commonly used consumer version, doubles that. Dolby C uses the same principles as Dolby B, but has two compressors operating in tandem so each operates on a separate portion of the overall dynamic range. In addition, its noise reduction begins two octaves lower than Dolby B. Basically, Dolby consumer noise reduction works by *increasing* the high-frequency (treble) sounds during recording and *decreasing* them during playback, which restores them to their original level, so the tape hiss added during recording is decreased during playback.

**Drop-out:** In digital audio it refers to a momentary break in the flow of stored information. In Compact Discs, drop-outs can be traced to two causes: a defect introduced during the use of the CD (such as a scratch or dirt), or a defect incurred during manufacture.

**Dynamic Range:** The ratio between the maximum and minimum signal level. Expressed in decibels (dB), higher numbers are better.

**Equalization (EQ):** An intentional departure from response flatness to compensate for complementary characteristics introduced elsewhere in the system (as with discs, tape, and FM broadcasting). Also used to correct for response deficiencies in speakers and other components.

**Expander:** A device used to restore natural dynamic range by counteracting the compression of dynamic range used in the making of recordings and in broadcasting.

**Filter:** A circuit that attenuates signals above or below a specific frequency without materially affecting signals in its passband.

**Flutter:** The audible effect of short-term record speed fluctuations, occurring at a low audio or an infrasonic rate (0.5 to 200 Hz). This causes a frequency modulation of the program material, heard as a wavering or roughness of the sound. It is described as a percentage of rated speed; the smaller this percentage, the less audible the flutter. The percentage is generally combined with wow. (See *Wow*.) It is often "weighted" (WRMS, weighted root mean square) so that it corresponds to the

average human hearing response. Lower numbers are better.

**Frame:** A frame is the smallest complete section of recognizable data on a disc.

**Frequency Response:** Always specified as a range, such as 50 to 15,000 Hz, but in order to be meaningful it must be further defined in terms of decibel variation from absolute flatness over a specified frequency range (e.g., 23 dB from 50 to 15,000 Hz). An indication of a sound system's ability to reproduce all audible frequencies supplied to it in proper balance to each other. Broader ranges and tighter tolerances are better.

**Hz:** The standard abbreviation of Hertz, the unit of frequency; one cycle per second.

**Initialization:** Initialization takes place when a CD is loaded into a player. The player spins the disc, and information encoded on it is read by the laser. This information includes the playing time of the disc, the number of tracks on the disc, and how long each track is.

**Interleaving:** Interleaving scatters data to various locations on the disc. It is a method of error correction used to prevent a single defect from destroying both the original data and that required to correct its loss.

**Laser:** An acronym for Light Amplification by the Stimulated Emission of Radiation. A device that produces coherent light of a single frequency.

**Large Scale Integrated Circuit (LSI):** An integrated circuit which contains 100 gates or more on a single chip, resulting in an increase in the amount of functions performed by a single integrated circuit.

**Line:** A term used to denote a high-level signal input or output circuit. Line level is usually of the order of a volt, as distinguished from the microphone or phono level of the order of millivolts.

**Loudness Compensation:** A form of equalization, coupled with the volume control, that progressively emphasizes low frequencies (and sometimes also high frequencies) relative to the middle frequencies as the volume is reduced. Intended to correct for the human ear's natural loss of hearing sensitivity at the frequency extremes when sound level is reduced.

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**Noise:** Any unwanted signal unrelated to the desired signal and tending to obscure it. In audio, noise is usually heard as hiss (random noise) or as hum (the power-line frequency and its harmonics).

**Oversampling:** A method of digital filtering that eliminates the need for sharp-cut output filters, decreases phase shifting, and increases signal-to-noise ratio.

**Pause Control:** A feature of many CD players that makes it possible to interrupt the playback of a CD at any point and allowing play to continue again from that point.

**Phase Shift:** Phase shift takes place when two identical analog signals have been delayed relative to each other in time. It can alter the nature of the signal and cause distortion.

**Pitch Control:** A circuit which permits a CD's speed to be varied slightly.

**Quantization:** The number of possible values available to represent various levels of amplitude of a digital audio signal. In the Compact Disc system, which uses binary (base 2) numbers, the resolution of the quantization is 16 bits, which means that each sample (see *sampling frequency*) can have any value between zero and 65,535. Higher numbers are better because they allow higher accuracy: 16 bit is more accurate than 14 bit.

**Reed-Solomon code:** The Reed-Solomon code is a multiple-error correcting code used in digital audio applications. It is particularly well suited for correction of burst errors.

**Rumble:** The audible effect of low-frequency vibration transmitted from the motor or other moving parts to the record or the tonearm. Heard (as a hum or rumbling sound) only when the pickup stylus is on a rotating record. Rumble is measured in dB below a specified signal level. Low numbers are better.

**Sample and Hold (S/H) Circuit:** A circuit that samples the analog waveform at a fixed and periodic rate. It holds the analog value of the sample until the analog-to-digital converter outputs the corresponding digital word.

**Sampling Frequency (or Rate):** In digital audio, the number of times a signal is sampled each second. In the Compact Disc format, the sampling rate is 44.1 kHz, meaning each second of

sound is encoded by 44,100 numbers for each channel. Higher sampling rates are better because they can record higher frequencies.

**Semiconductor Laser:** A semiconductor electron device which converts electrical input directly into coherent optical output power.

**Signal-to-Noise Ratio (S/N):** The ratio of magnitude of the signal to that of the noise (often expressed in decibels). Higher numbers are better.

**SPARS code:** A three-letter code devised by the Society of Professional Audio Recording Studios. It is an indication of the methods used in the production of a recording (analog-A or digital-D). Reading from left to right, the first letter of the code tells you what kind of tape recorder was used for the original recording, the second letter indicates what kind of recorder was used in the mix-down, and the third describes the mastering. A Compact Disc bearing the code AAD means that the original recording A, and final mixdown A, was made on an analog recorder. The last letter D tells you that the mastering, as for all CDs was digital.

**Subcode:** Each *frame* of a CD contains eight bits reserved for subcode information. Two of these bits are used to store information for the disc table of contents detailing total number of selections on the disc, their beginning and ending points, index points within a selection, program beginning and ending points, and preemphasis on/off control. The six remaining bits are available for other applications, such as encoding video information on audio CDs.

**Synthesizer:** A system for generating a precise and stable frequency whose accuracy is determined by a quartz crystal oscillator, instead of inductance/capacitance tuned circuits.

**THD (Total Harmonic Distortion):** The ratio of the power at the fundamental frequency measured at the output of the system considered, to the power of all harmonics measured at the output of the system because of its nonlinearity when a single frequency is applied to the input of the system.

**Wow:** The audible effect of a low-frequency flutter, occurring at a rate of 0.5 to 10 Hz. Most audible and objectionable on sustained tones. Lower wow numbers are better. See *Flutter*.

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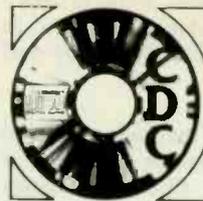
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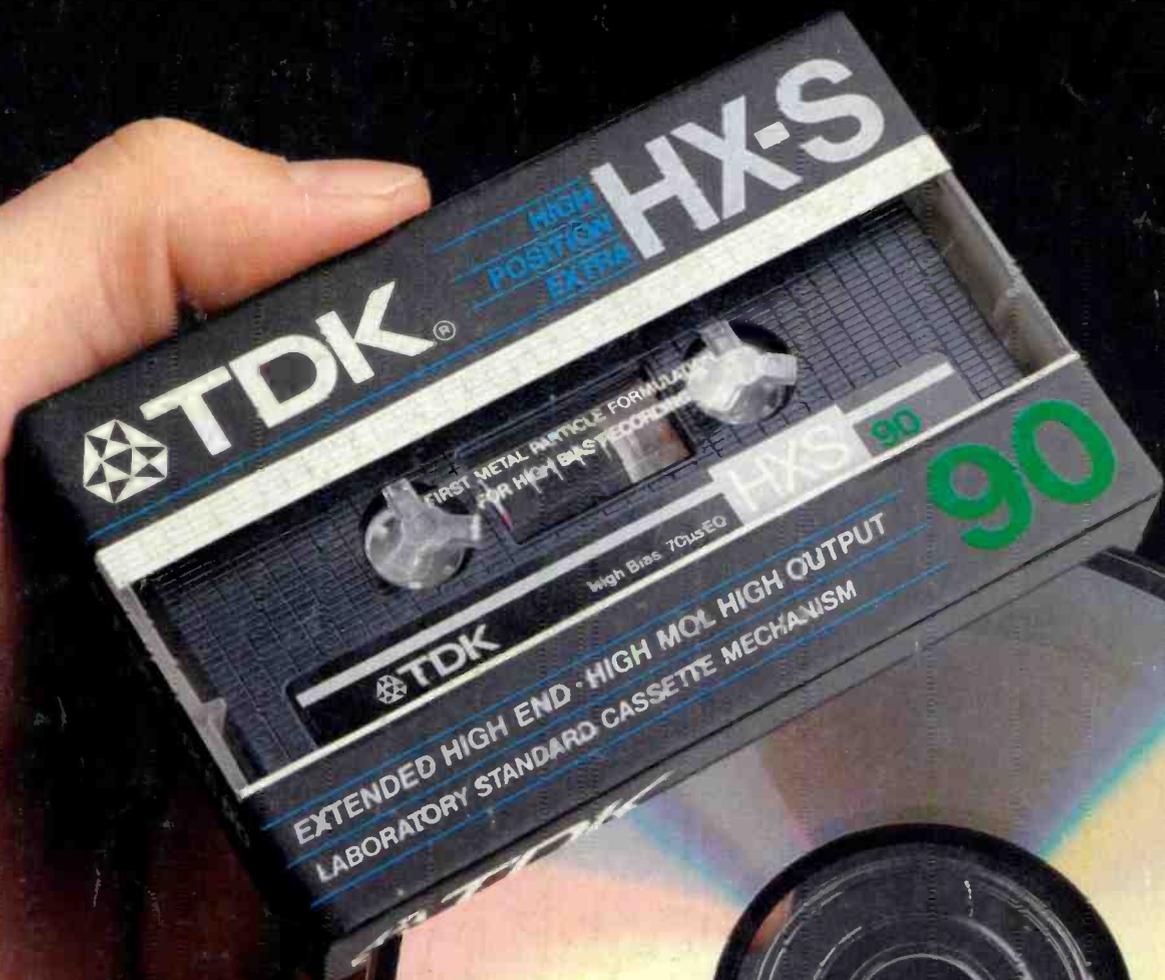
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