

Troubleshooting and Repairing CD Players and CD-ROM Drives



VER THE NEXT FEW MONTHS WE ARE GOING TO LOOK INTO ALL THE CD AUDIO AND CD-ROM PLAY-

ERS THAT ABOUND AROUND US. WE'LL BEGIN WITH A LOOK AT THE BASICS OF HOW THESE DEVICES WORK. THEN WE WILL MOVE ON TO

maintenance, repair (including whether or not one of these units is worth repairing), disk care and repair, and more. We will conclude the series with some notes about specific equipment repairs.

Most of the information that we'll be presenting applies to CD players in component stereo systems, compact stereos, boom boxes, car units, and portables, as well as CD-ROM drives. The primary differences between those relate to how the disc is loaded; for example, portables are usually top loaders without a loading drawer. The one thing that is true regardless of the type of unit is that everything is tiny; and most or all of the electrical components are surface mounted on both sides of an often inaccessible printed-circuit board, with the entire unit assembled using screws that have minds of their own and a desire to be lost.

Note that Laserdisc players and optical-disk storage units have much in common with CD players. They tend to use similar mechanical components and front-end electronics. Therefore, this column will also help you get started troubleshooting these items as well.

Things That Go Wrong

Many common problems with CD players can be corrected without the service manual or the use of sophisticated test equipment. CD-player problems break down into specific groups:

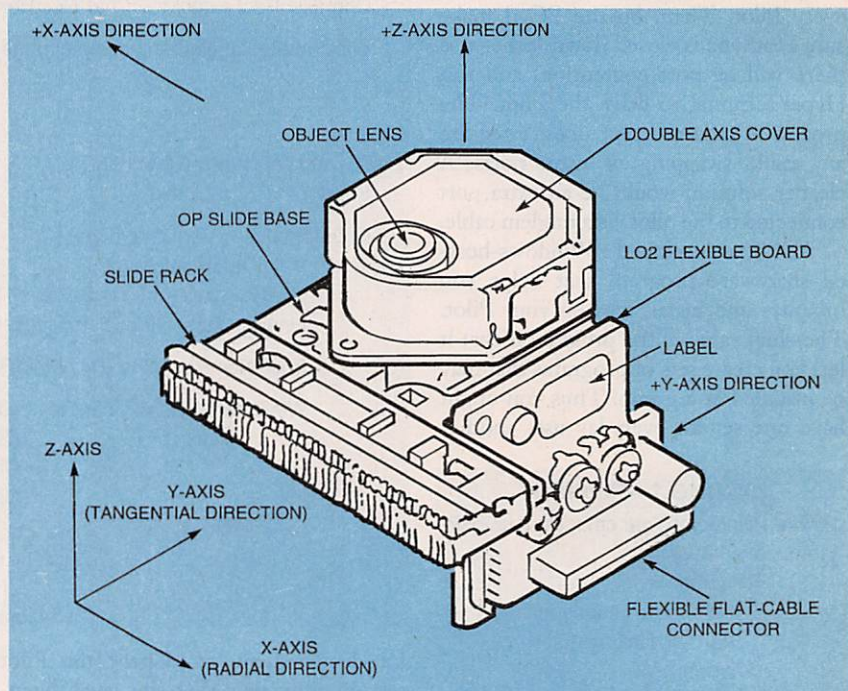
• **Mechanical:** Problems here include

dirt, lubrication, wear, deteriorated rubber parts, dirty/bad limit switches, and physical damage. A dirty lens—easily remedied—is probably the number one cause of common problems such as discs not being recognized, audible noise, and erratic tracking. Even professionals may be led to believe that those symptoms are being caused by much more serious (and expensive) faults. Don't be fooled!

• **Electronic Adjustments:** These include coarse tracking, fine tracking, focus, and laser power. Note that some newer CD players no longer have all of these adjustments.

• **Electronic Component Failure:** These are rare except for power-surge (storm and lightning strike) related damage, which, if you are lucky, will only blow out components in the power supply.

You can often repair a CD player that has a mechanical- or electronic-adjustment problem. The only real exception is a problem in the laser power supply, which I would not attempt to repair without a service manual and/or proper instrumentation, except as a last resort; im-



A CD PLAYER'S OPTICAL PICKUP must position the focal point of the laser beam to an accuracy of around 1 μm (micron or .000001 meter) and features complex electronic and mechanical components; yet the most common "repair" you'll need to do is to clean a dirty lens.

proper adjustment of the supply can ruin the laser. Note that if the player recognizes discs, or even if the unit only focuses correctly, then the laser diode and its power supply are probably fine. While laser diodes can and do fail, don't assume that every CD player problem is laser-related. In fact, only a small percentage (probably under 10%) are due to a failure of the laser diode or its supporting circuitry. Mechanical problems such as dirt and lubrication are the most common faults. Electronic (servo) adjustments come second.

Component failures in the power supply can be repaired fairly easily, but most other electronic failures are difficult to locate without the service manual, test equipment, and a detailed understanding and familiarity with audio CD technology. However, you might get lucky.

Repair or Replace?

While CD players with new, additional, and better convenience features are constantly introduced, the basic function of playing a CD has not changed significantly in the past 15 years. None of the advancements—including digital filters, oversampling, one-bit D/As, and such—are likely to make any difference in the listening pleasure of most mortals. Most people who care do so only because they are more concerned with the technology than the musical experience. Many of these so-called advances were done, at least in part, to reduce costs—not necessarily to improve performance.

So, unless you really do need a 250-disc CD changer with a remote control that has more buttons than a Boeing 777 cockpit and 2000-track programmability, a 10-year-old CD player will sound just about as good as a new unit and therefore might be worth repairing. Also, note that many older CD players were built more solidly than more recent models; even some of the new high-end CD players may be built around a mostly plastic optical deck and a flimsy chassis.

If you need to send or take the CD player or CD-ROM drive to a service center, the repair could easily exceed the cost of a new unit. Service centers charge up to \$50 or more for providing an initial estimate of repair costs, but that is normally credited toward the total cost of the repair. It does take time to find problems, and a professional technician's time is costly these days.

If you can manage to do the repairs yourself, the equation changes dramati-

cally. Your parts costs will be lower than what a professional will charge and, of course, your time is free. The educational aspects might also be appealing—you will learn a lot in the process. So it might make good sense to tackle that busted CD player in that bedraggled old boom box after all.

CD Technology

Information on a compact disc is encoded in minute pits that reside just under the label side of the CD. The CD itself is stamped in much the same way as an old style LP, but under much more stringent clean-room conditions. The CD pressing is then aluminum-coated in a vacuum chamber, and the label side is spin-coated with a protective plastic resin and printed with the label.

CD-Rs—recordable CDs—are slightly different. CD-R blanks are pre-stamped with a spiral guide groove and then coated with an organic dye layer followed by a gold film, resin, and label. The dye layer appears greenish and deforms upon exposure to the focused writing laser beam to form pits and lands..

The newest variation—DVDs (Digital Versatile Disks or Digital Video Disks, depending on whom you listen to)—implement a number of incremental but very significant improvements in technology that add up to a spectacular increase in information density—almost 10:1 for the same size disc. Those improvements include a higher-frequency laser, closer track spacing, better encoding, and a double-sided disc. According to early reports on the final specifications, DVDs are able to store 8 times the audio of current CDs at a higher sampling rate and bit resolution, 2 hours of MPEG-encoded high quality movies, and all kinds of other information. Raw data capacity is somewhere between 5 and 10 gigabites.

From here we are going to move on to maintenance and repair, but for those readers who would like an on-line introduction to CD and optical-disc technology, check out the www.philipsmagnavox.com/product/pe33.html (Philips/Magnavox Electronics Reference) Web site. There you will find links to a number of articles on the basic principles of operation of CD players, Laserdiscs, optical drives, TVs, VCRs, cassette decks, loudspeakers, amplifiers, satellite receivers, and other consumer A/V equipment.

If you go to www.umn.edu/nlhome/g496/eric0139/Papers/paper.html (A Fundamental Introduction to the Compact

Disc Player), you will find a somewhat more theoretical discussion of compact-disc audio technology with diagrams and even some equations.

Preventive Maintenance

Taking good care of a CD player is not difficult. There are four simple considerations. First, try to keep the player in a cool location. While CD players do not produce any significant amounts of heat, keeping them cool will minimize wear and tear on the internal components and assure a long, trouble-free life. Second, keep CD players out of dusty locations and avoid areas with high levels of tobacco smoke or cooking-grease vapors. I cannot force you to stop smoking, but it is amazing how difficult it is to remove the brown grime deposited by smoking on sensitive electronic equipment. Third, make sure that all audio cables are connected firmly and are tight and secure. That will go a long way toward minimizing intermittent or noisy sound. Finally, store all of your CDs away from heat. The polycarbonate plastic that they are made from is quite sturdy, but high temperatures will eventually take their toll. Always return them to their cases when they are not being played.

No doubt, you have heard that a CD player should be cleaned and checked periodically. For the most part, that is nonsense. CD players, despite the astonishing precision of the optical pickup, are remarkably robust. Optical alignment is almost never needed for a component CD player and is rarely required even for portable or automotive units.

An occasional internal inspection and cleaning is not a bad idea, but it is not nearly as important as for a VCR. Realistically, then, you are unlikely to do any preventive maintenance; so let me just point out the types of symptoms that indicate the need for a cleaning or other preventive or corrective maintenance. Those include problems like erratic loading, a need to convince the CD player to cooperate and play a disc, audio noise, skipping, sticking, or taking longer than usual to recognize a disc or complete a search. Of course, acute symptoms, like refusing to play or to open the door, are definite signs that immediate emergency treatment is needed.

Generally, I do not consider CD-lens cleaning discs to be of much value for preventive maintenance, since all too often they only move the crud around. However, for non-greasy dust, they

might do a good enough job for a proper cleaning to be put off for a while longer.

Although CDs are much more tolerant of abuse than LPs, some precautions are still needed to assure long life. Also, even though only one side is played, serious damage to either side can cause problems during play or even make the CD totally useless. It is important to protect the label side from major scratches that could penetrate to the information layer. Even with the sophisticated error-correction systems used, damage to this layer, particularly if it runs parallel to the tracks, can make the CD unusable.

Remember, the CD is read by focusing a laser beam through the bottom 1.2 mm of polycarbonate. As a result of the design of the optical system used in the laser pickup, the beam diameter is about 1 mm at the bottom surface, and thus small surface scratches appear out of focus and in many cases are ignored. At the information layer, however, the beam diameter has been reduced (by precise focusing) to under 2 μ m. Here, scratches running parallel to the tracks can cause the optical pickup to get "stuck," repeating a track, jumping forward or back a few seconds, or creating noise or other problems.

That's all for now. Until next time, if you have any specific problems or questions, contact me directly at sam@stdavids.picker.com. For general information on electronics troubleshooting and repair, you can visit my Web site at www.repairfaq.org. **EN**

COMPUTER CONNECTIONS

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SMALL C COMPILERS

Mix Power C: www.mixsoftware.com
Micro-C/PC: www.dunfield.com/downld.html
Pacific C: www.hitech.com.au/pacific.html
Dr. Dobb's Small-C Resource CD-ROM:
www.ddj.com/cdrom
Cmm: www.nombas.com

Pilot Developer Resources

www.ingeninc.com
www.wademan.com/Pilot/Program/FAQ.htm
www.massena.com/darrin/pilot/index.html
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www.usr.com/palm/pilotlinks.html
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www.shoppersmart.com/jlehet/gccwin32.html
www.usr.com/palm/dresources.html
www.metrowerks.com (general info)
www.metrowerks.com/db/updates.qry?function=list&sw=CWPP3 (patches)

Newsgroups:

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Regarding compilers *per se*, numerous people wrote to suggest various alternatives. One of the most popular is Mix Power C, suggested by several people, including Jim Goodman. Jim also recommended Pacific C and Micro-C/PC. Pacific C is available free for noncommercial use. Micro-C/PC is a targetable C compiler that generates code for several microprocessors and microcontrollers.

For learning purposes, I would recommend checking out *Dr. Dobb's Small-C Resource CD-ROM*, published by *Dr. Dobb's Journal*, one of the oldest PC-oriented programming magazines. I haven't seen the CD-ROM, but I have an old version of Small C on my system; it includes complete source code for the compiler and libraries. Alas, the version I have doesn't do pointers, but more recent versions might. Another interesting alternative is Cmm, (C-minus-minus) a sort of scripting environment heavily influenced by C, but without the hard stuff (pointers and memory management). **EN**

NEW PRODUCTS

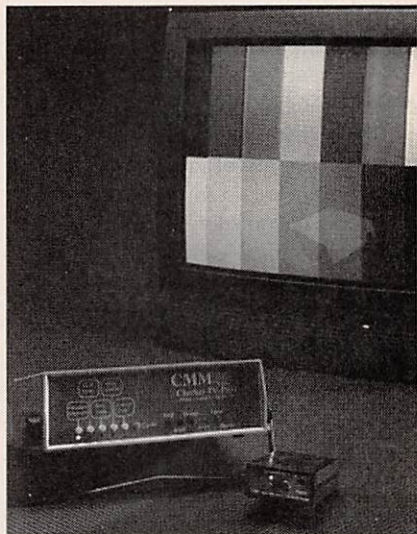
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AEMC Instruments

99 Chauncy Street
Boston, MA 02111
Tel: 800-343-1391 or 617-451-0227
Fax: 617-423-2952

TV Test-Pattern Generator

Checker TV PRO and Checker TV Jr. are suitable for both test bench or field operation. Among TV PRO features are split-field color bars, gray scale, S-video output, RF output, and one-volt video. A stereo processor and tone generator allows the stereo detection and audio portions of the receiver to be tested. Patterns include a cross hatch with dots and white screen. Red, green, and blue signals are push-button selectable, as is the stereo signal and the audio tone. The unit can be AC or battery operated.



CIRCLE 22 ON FREE INFORMATION CARD

Small enough to fit into your hand (1 \times 2 \times 3-inches), the TV Jr. is convenient for field use, fitting easily into the technician's pocket or toolbox. The Jr. has color bars; white, red, blue, green, and black screens; and cross hatch with dots. The various patterns are selectable by a single push button. Operating on a 9-volt battery, its output is 1-volt RS-170 NTSC color video.

Both generators are NTSC, RS-170 video compatible, and have complex synchronization. The suggested retail prices are \$599.99 for the Checker TV PRO and \$149.99 for the Checker TV Jr.

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