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Overview

Easy-CD is an extension to Windows' File Manager which allows you to quickly and easily write selected files, directories, or entire volumes to recordable compact disc in the ISO 9660 format. When the program is installed, an extra menu (**Easy-CD**) appears in File Manager, containing the commands which allow you to record selected files/directories to compact disc.

System Requirements

Hardware: Minimum Configuration

- PC 486/33 (33 MHz clock speed) with four megabytes of RAM.
- 3.5" floppy disk drive.
- Fast hard disk (average access time should be less than 19 msec, transfer rate 600 kilobytes per second or better), large enough to hold your application executables and data.
- SCSI host adapter supporting ASPI, and cabling. This software does not require two SCSI cards, nor are there any performance benefits to be gained by this configuration.
- CD recorder.

Software

- MS-DOS 5.0 or later
- Microsoft Windows™ 3.1 or Windows for Workgroups 3.11
- ASPI DOS Manager or WinASPI for the SCSI board you are using.

Hardware Installation

Installing the SCSI Card

1. Install the SCSI host adapter card in your computer. Refer to the manual that came with your SCSI card for more information.
2. Install the software that comes with the board, making sure that the ASPI shell is correctly copied and installed.
3. Reboot your computer.

Installing the CD Recorder

1. Connect the SCSI cable to the SCSI interface card in your computer. Connect the other end to one of the SCSI ports at the back of the CD recorder. Use only good-quality, shielded SCSI cables.
2. You can use the other ports to daisy-chain the CD recorder with other SCSI devices. In this case, be sure to set a different SCSI ID for each device on the chain. (See your CD recorder's manual for settings to change the SCSI ID.)
3. Connect the power cable to the CD recorder and to an outlet.
4. If no other devices are connected to your CD recorder, you may need a SCSI terminator. Check your CD recorder's manual to determine whether it is self-terminating; if it is not, you should put a SCSI terminator on the unused SCSI port.

Your CD Recorder

When you open File Manager, your CD recorder is automatically recognized and installed. If you have more than one CD recorder, or if you turn it on after starting File Manager, choose *Select CD Recorder* from the **Easy-CD** menu.

If more than one CD recorder is recognized, a dialog box like this will open (the numbers in parentheses are only examples of possible SCSI ID, LUN, and host adapter numbers!):



Select the desired device and click on **OK**. This setting will be maintained until your setup changes or you *Select CD Recorder* again.

Compatibility with Easy-CD Pro & MM

If you are now or later become a user of *Easy-CD Pro* or *MM*, you need to know the following:

With Version 2.12 or Earlier of Easy-CD Pro/MM

If you attempt to start *Easy-CD Pro* while *Easy-CD* is active, the results will be unpredictable (possibly no reaction at all, or a system freeze or crash). We therefore recommend that you upgrade to *Easy-CD Pro* version 3.0 or later.

With Version 3.0 or Later of Easy-CD Pro/MM

If *Easy-CD Pro* is open and you try to use *Easy-CD*, you will see the message "XCD engine already in use." If one of *Easy-CD*'s dialog boxes (*CD Info*, *Preferences*, etc.) is open and you attempt to launch *Easy-CD Pro*, you will see the same error message, and *Easy-CD Pro* will not start. So you can have both the programs on your machine, but you can use only one at time.

Quick Start

1. After installation is complete (and you have quit and restarted File Manager, if it was active), you will see a menu called **Easy-CD** in File Manager's menu bar.
2. In the Directory Contents window (the right-hand side of File Manager), select the files/directories you want to record to CD. You can use Windows' extended selection commands to select multiple files/directories.
3. Choose *Add Files to List* from the **Easy-CD** menu. The items you selected are now in the list ready to be written.

If you prefer, you can avoid to use the Add Files to List function by selecting directly Write File List to CD; the list will be created anyway and the write dialog will appear showing you the Dirs./Files List to write. This only works if you have not already created a list.

4. From the **Easy-CD** menu select *Write Files List to CD*; a dialog box will show you the *Dirs./Files List* to write. If you wish to add more files/directories to the list click on **Cancel** to exit the dialog box, select the additional items, and again choose *Add Files to List* from the **Easy-CD** menu. The items you just selected are now added to the list.
5. You could at this point begin writing immediately by clicking on the **Write** button, but we strongly recommend that you first run a speed test, to see which is the safest write option for your system: "Write Directly to CD" or "Write First to Hard Disk" (for more details, see the chapter *Writing to CD*).
6. In the *Easy-CD Write to CD* dialog, choose **Preferences**. The *Preferences* dialog will open.
7. Select **Speed Test**. The software will test your system and will suggest the best write speed and mode according to your system's capabilities. Options in the *Preferences* dialog box are automatically set accordingly.
8. Insert a writeable CD and click on **Write**. The writing process will be carried out without further input from you.

Adding Files in Subsequent Writes

When you add data to a disc in subsequent writes, *Easy-CD* will always add all the files that are in your File List, also if some files/directories are already present in the CD.

The resulting discs are multisession discs, and must be read on a multisession CD-ROM drive, or using the CD recorder itself. See the *Troubleshooting* chapter for details.

If you want to recover an earlier version of a file from an earlier session of a multisession disc, use the *CD File History* function. (See the *CD Info and CD File History* chapter for details.)

How Much Information Can a CD Hold?

Due to the audio origin of CDs, the amount of information a CD can hold is measured in minutes:seconds:sectors. Each second contains 75 sectors, each of which can hold 2048 bytes (2 kilobytes) of user data. Recordable CDs come in 21- (80 mm diameter), 63-, and 74-minute sizes (both 120 mm diameter), which can contain:

$$(21 \text{ min}) \times (60 \text{ sec}) \times (75 \text{ sectors}) \times (2 \text{ kbytes}) = 189,000 \text{ kilobytes} \\ = \mathbf{184} \text{ megabytes}$$

$$(63 \text{ min}) \times (60 \text{ sec}) \times (75 \text{ sectors}) \times (2 \text{ kbytes}) = 567,000 \text{ kilobytes} \\ = \mathbf{553} \text{ megabytes}$$

$$(74 \text{ min}) \times (60 \text{ sec}) \times (75 \text{ sectors}) \times (2 \text{ kbytes}) = 660,000 \text{ kilobytes} \\ = \mathbf{650} \text{ megabytes}$$

Files on CD do not occupy a space exactly equal to their original size, but usually a bit more. This is because the minimum recordable unit on a compact disc is the logical block. In theory a logical block could be 512, 1024 or 2048 bytes in size. In practice, only the 2048-byte block size is currently supported. This means that a file will occupy a space equal to the closest (higher) multiple of 2048 bytes. In ISO 9660, just as on your hard disk, directories are also files, and also take up space.

The Yellow Book (the standard defining the physical format of CD-ROM) specifies that the CD data starts after a pause of two seconds. This means that the first two seconds on a CD are not available for user data.

So, from the theoretical capacity of any CD you must subtract:

$$[(2 \text{ sec}) \times (75 \text{ sectors}) \times (2 \text{ kilobytes})] = 300 \text{ kilobytes, plus}$$

$$[(6500 \text{ sectors } \textit{lead-in}) \times (2 \text{ kilobytes})] = 13000 \text{ kilobytes}$$

Furthermore, the ISO 9660 file structure needs space for the following:

- Root file: Minimum 1 sector
- Path Tables: Minimum 2 sectors
- Primary Volume Descriptor: 1 sector
- Volume Descriptor Set Terminator: 1 sector
- The first 16 sectors are also reserved for system use.
- 4650 sectors for the session lead-out and pre-gap.

If more sectors are needed to store the complete Path Tables or if the Root directory size exceeds one sector as files are added, the CD image is dynamically adjusted.

All of these factors add up to a minimum of 21642 kilobytes which will not be available for your data, a fact which you must keep in mind when determining how much information you can fit onto the CD.

Furthermore, if you add data in subsequent sessions, you will lose 13 megabytes per session.

Selecting the Files and Directories to Write

Highlight the desired files/directories in the right half (directory contents) of the File Manager window. You can use Windows' extended selection commands to select multiple files/directories:

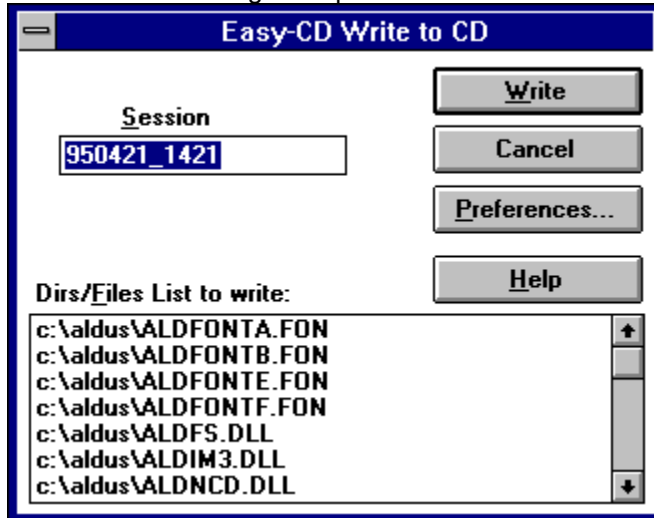
- To select multiple contiguous files, hold down the Shift key while selecting the top and then the bottom file of the desired group.
- To select multiple non-contiguous files, hold down the CTRL key while selecting the desired files.

You can use File Manager's *Sort by* commands in the **View** menu to help you select the files you want, for example sorting by type to quickly select all files of a certain type within a directory.

When you have selected the files you want, select *Add Files to List* from the **Easy-CD** menu to create a list to write on the CD. The list is maintained until File Manager is closed.

Easy-CD Write to CD Dialog Box

When the list of files/directories you want to write is complete, choose *Write Files to CD* from the **Easy-CD** menu. This dialog box opens:



If the list shown is not what you want, click on **Cancel** to exit this dialog box. Select *Clear File List* from the **Easy-CD** menu and then select the new files/directories to be written.

Write

Click to write the current list of Dirs/Files List to CD.

Cancel

Exit the dialog box without writing. The Dirs/Files List will be maintained until you close File Manager, in case you wish to add other items to the list, or write at a later time.

Session

Set by default to the current date and time (in the format YYMMDD_TIME), but you can change it to any combination of 11 or fewer alphanumeric characters.

Dirs/Files List to Write

The complete paths of all files/directories you had selected for writing is shown here.

Multiple Copies

When the write operation starts, if you have inserted a blank media into the CD Recorder this dialog box opens:



This dialog box let you control the productions of little batch of CD, all with the same contents.

CD Copies

Enter the number of CDs that you need. Every CD will contains all the data in your File List. The writing process start on current CD. At the end of every CD a message like this: "Please, insert another blank CD in the drive to make copy 2 of 4" will inform you that another blank CD is needed.

If you insert a CD that is not blank (with previously written tracks) you will see this message: "The CD is not blank. To make multiple copies, please insert a blank CD into the drive".

OK

Click to write the current list of Dirs/Files List to the first CD.

Cancel

Exit the dialog box without writing. The Dirs/Files List will be maintained until you close File Manager, in case you wish to add other items to the list, or write at a later time.

Preferences

When you click on the **Preferences** button, this dialog box opens:



(The "Write Directly to CD" and "Write First to Hard Disk" options are described in detail below.)

Progress Dialog

If selected, during writing a dialog box with a percentage bar will keep you informed of progress.

Writing speed

Select the desired speed; the options available will depend on your CD recorder.

Temporary directory

Easy-CD needs some hard disk space for index files. Enter the path of a temporary directory in this box; the default is the system temporary directory. (If you enter an invalid directory, a message will appear telling you that the temporary directory has been reset to the default system temporary directory.)

If you select to "Write First to Hard Disk" before writing to CD, ensure that the temporary directory can hold *the total amount of data to be copied to compact disc*; if there is not enough space to create the image in the selected directory, you will be warned and no data will be written. All temporary files are deleted when writing is completed.

Speed Test

The speed test will give you information about the number of the files and total amount of data to be written, the writing time required in seconds, and system throughput in kilobytes per second. The dialog box will also suggest the optimum writing speed and mode for your system.

Related Topics:

[Write Directly to CD](#)

[Write First to Hard Disk](#)

Write Directly to CD

"Write Directly to CD" means to copy your files directly from hard disk to compact disc. The list of files to be written to CD is stored temporarily in a small database called the virtual CD image, which keeps track of where files are stored on hard disk, and where they will be recorded on CD.

The advantage of writing directly to CD from a virtual image is that it requires little extra space on your hard disk. However, it demands a great deal from your system. Click on **Speed Test** before writing directly to CD. If your system cannot keep up with writing directly to CD, you will be advised to use "Write First to Hard Disk."

Write First to Hard Disk

If for any reason your system cannot keep up with writing directly to CD, you can write "Write First to Hard Disk." This means that a real ISO image of all your data will be written first on hard disk, and then that image will be written to compact disc.

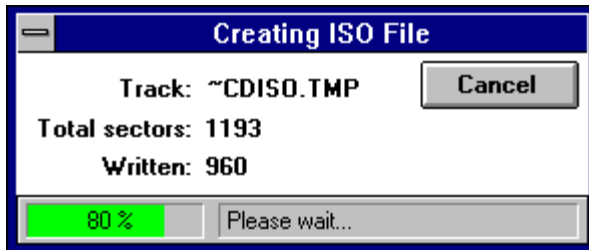
"Write First to Hard Disk" is much less demanding on your system than writing directly to CD. However, remember that the ISO image will need as much space on your hard disk as the total amount of data to be written to CD. Writing to hard disk also takes time, so the overall process of getting your data to CD will take a bit longer. However, in marginal situations, this option can make the difference between getting your files onto CD – and not

Related Topics:

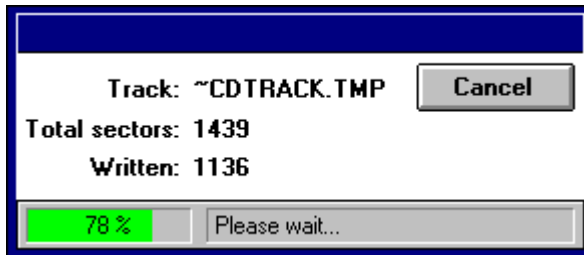
[Write First to Hard Disk: Step-by-Step](#)

Write First to Hard Disk: Step-by-Step

1. Create the *Dirs/Files List* as described above.
2. When all the settings in the *Preferences* dialog box are correct as described above and the "Write First to Hard Disk" radio button is selected, click on **Write**.
3. This dialog box is shown while writing to hard disk:



4. When the system has finished writing the real ISO image on hard disk, the write progress dialog (if selected) will keep you informed:



5. When all the data is written, another dialog box will tell you that the session is being closed, and then a "Written successfully" message will appear.

Writing Files from a Network

If the files you wish to write to CD are located on a different station of a network (or on any other slow device such as a floppy diskette or magneto-optical drive), you may have to select "Write First to Hard Disk" to write a real ISO image of all the data on the hard disk where the CD recorder resides; in this way you can be sure of an adequate data throughput for disc writing (see the *Troubleshooting* chapter for details).

With the networked volume open in File Manager, select the items to write as usual.

Make sure that the temporary directory selected for writing to hard disk is on the local drive, and that it has enough space free to contain all the data.

Writing More Than Once to the Same Disc

If you do not fill up all the space on your disc when you first write to it, you can continue adding data in one or more subsequent sessions.

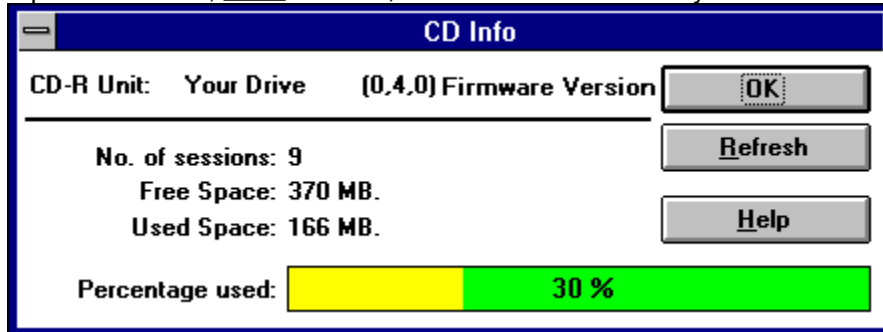
When you read the disc in a multisession CD-ROM drive or your CD recorder with an appropriate software driver, you will have a "global" view of all the data on the disc. Where files have been "replaced" by more recent versions, you will always see the most recent version. However, you can use the *CD File History* function described below to recover earlier versions if you need to.

Keep in mind the following:

- The disc to which you wish to add data must be in the CD recorder when you first open the *Easy-CD Write to CD* dialog box.
- To read the disc you will need a multisession CD-ROM drive with an appropriate software driver, or the appropriate driver for your CD recorder. With an appropriate drive and driver, you will always see the last session on the disc, which will include all the files written in the most recent session, as well as files written in previous sessions (if they have not been "overwritten" by newer versions). If you write more than one session on a disc but can still read back only the first session, it may be that your CD-ROM drive does not read multisession properly. See the *Troubleshooting* chapter for details on Problems in Reading Multisession Discs.
- Every time you write to disc a session is closed. Closing a session takes about thirteen megabytes of extra space on disc for the session lead-out. This isn't excessive if you are recording only a few sessions per disc, but do remember that you will be losing that portion of the disc's capacity every time you close a session.

CD Info

CD Info can be used to examine any disc you have written or are going to write. The dialog box also reports the name, SCSI address, and firmware revision of your CD recorder.

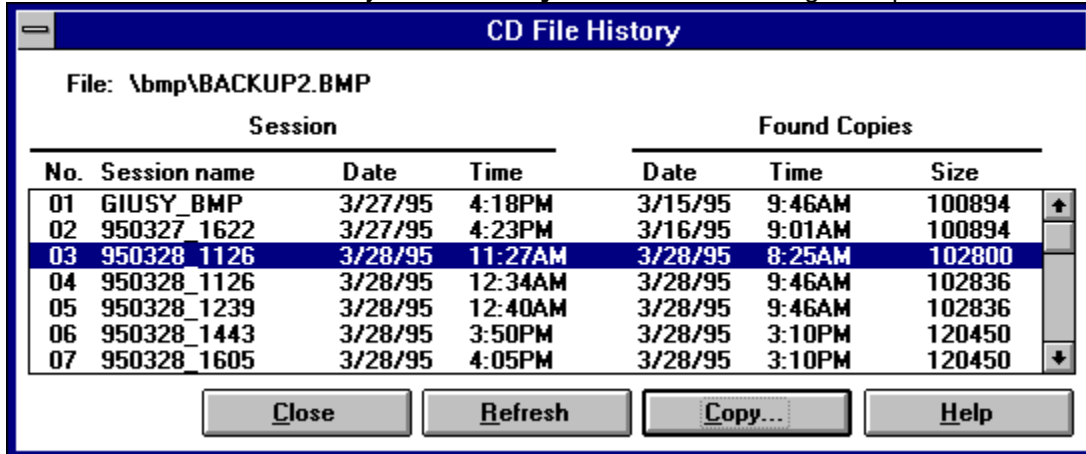


- **No of Sessions.** The total number of sessions recorded.
- **Free Space.** The amount of free space, expressed in megabytes, available for recording on the CD. On a closed or commercially-pressed disc this value is always zero.
- **Used Space.** The amount of space used on disc, expressed in megabytes.
- **Percentage used.** The amount of space used on disc, expressed as a percentage of the total space.
- **Refresh.** Use when a new CD is inserted in the drive or to retry to read the disc information if the unit is not yet ready.

CD File History

Because recordable CD is a write-once medium, it is not physically possible to overwrite or delete files already on the disc, so no matter how many times you "overwrite" old files with new versions in subsequent write sessions, all the previous versions are still on disc and can be retrieved at any time using this function. Here's how:

1. In File Manager, select the file from the CD or hard disk.
2. Choose *CD File History* from the **Easy-CD** menu. This dialog box opens:



1. The following information is displayed:

File:

The file name and path you selected.

Session:

No. The number of the session in which the file has been found.

Session name. The name you gave that session.

Date/Time: The date and time you recorded that file on the CD.

Found Copies:

Date/Time: The date and time of the file found on CD.

Size: The size of the file found on CD.

1. Highlight the version of the file that you want to recopy to hard disk and click on **Copy**. A dialog box will appear in which you can rename the file and/or choose a new target directory in which to place it.
2. If you need to search for the file on more than one CD, eject the old disc, insert a new one, and click on **Refresh** to load information about the new disc in the drive.

Easy-CD Menu

[Add Files to List](#)

[Write File List to CD](#)

[Clear File List](#)

[CD File History](#)

[Preferences](#)

[CD Info](#)

[Eject/Tray](#)

[Select CD Recorder](#)

[Help Contents](#)

[About Easy-CD](#)

Add Files to List

Add files already selected in File Manager to the Files List you are building.

Write File List to CD

Selecting this function before creating a list, generates a list with the highlight items and opens the *Easy-CD Write to CD* dialog box.

Selecting this function after creating a list, opens the *Easy-CD Write to CD* dialog box; see [Easy-CD Write to CD Dialog Box](#).

Clear File List

Clear the *Dirs/Files List* in the *Easy-CD Write to CD* dialog box.

CD File History

Select this command after highlighting a file in File Manager. The CD File History dialog box will open, reporting all the copies and versions of that file found on the CD mounted in the CD recorder. See [CD File History](#) for details.

Preferences

Open the *Preferences* dialog box where the CD recording options may be set. See [Preferences](#) for details.

CD Info

Provides information about the disc currently mounted in the CD recorder. See [CD Info](#) for details.

Eject/Tray

Opens and closes the disc tray of your CD recorder.

Select CD Recorder

Opens a dialog box displaying all the CD recorders attached to your system (if you have more than one) so that you may choose the one to use with *Easy-CD*. The setting is maintained until you open this dialog again or your system configuration changes.

Help Contents

Opens the On-Line Help.

About Easy-CD

Provides the software version and other information about *Easy-CD*.

Factors in Writing to CD

Why You Should Read This

Writing data to recordable compact disc is a complex process which demands a great deal from both hardware and software. Most of this complexity is hidden from the user, but you should be aware of these factors which influence the success of the operation.

The Data

The amount of data you are writing is less important than whether it contains a few large or many small files; in the latter case the system may have trouble locating and opening the files quickly enough to send them smoothly to the CD recorder.

The System

By system we mean your computer and all the software running on it. ANY interruption is fatal to CD recording, so ensure that your CONFIG.SYS and AUTOEXEC.BAT do not load any TSR utilities which may periodically or otherwise interrupt operations. Screen savers, alarms or reminders, and incoming faxes will kill disc writing. You should also turn off network sharing so that no one can access the files you're trying to write – this would also fatally interrupt writing.

Related Topics:

[The Hard Disk](#)

[The CD Recorder](#)

The Hard Disk

Speed

To write directly to compact disc, the hard disk from which you are writing **MUST** have a transfer rate fast enough to keep the memory buffer full in the CD recorder. This usually means an average hard disk access time of 19 milliseconds or better.

Fragmentation

Having to search all over a very fragmented hard disk for the data to be written (whether directly to CD or writing to hard disk before) causes operations to slow down, possibly fatally. Defragment your hard disk!

Thermal Calibration

All hard disks automatically periodically perform a thermal calibration to ensure proper functioning. Calibration interrupts hard disk operations for as much as one and a half second. Some hard disks force a calibration at fixed intervals, even if the disk is in use, causing interruptions fatal to real-time operations such as CD writing. This problem arises particularly when the amount of data to be written is large.

Some hard disks calibrate intelligently, postponing it when the disk is being used. Fujitsu and many Micropolis hard disks work this way.

The CD Recorder

Recording Speed

Many new CD recorders (and some old ones) are capable of writing at two (or even four) times the standard writing/playback speed of 150 kilobytes (75 sectors) per second. Ideally, it should be possible to choose the speed (and wherever the unit allows it, our drivers do give you the choice), because, although writing faster is a timesaver in some situations, in others it causes problems. Let's see why.

CD recording occurs in real-time. Data is transferred from the computer's hard disk to the buffer memory of the CD recorder, and thence to the recording laser, which inscribes pits into the surface of the CD at a steady speed which cannot be altered or interrupted. The speed at which data must be transferred depends on the mode in which the data is written and on the speed selected.

Format & Mode	Required transfer rate at:		
(bits/sector)	1x	2x	4x
CD-ROM Mode 1 (2048)	150 kilobytes/second	300 kilobytes/second	600 kilobytes/second

When you select "Write First to Hard Disk," speed is rarely a problem because the image is already one gigantic file in which the files and structures are already in order and divided into CD-ROM sectors, so it is only necessary to stream off the data to the recorder.

When you write a virtual image, things get trickier. Now, in order to write to CD, the program must consult its database to find out where each file should go in the image and where it actually is stored on hard disk. It must then open the file and divide it into CD-ROM sectors, all the while sending the data in a smooth, continuous stream to the recorder. Locating and opening the file is often the more time-consuming part of the process, which is why "Write Directly to CD" writing becomes more difficult when you have many small files.

The Recorder's Buffer

The CD recorder's buffer memory helps to ensure that there is always data ready to be written, by storing extra data as it arrives from the computer. The size of the buffer is therefore critical to trouble-free writing: a slow-down or small interruption in the transfer of data from the computer will not interrupt writing *so long as the buffer is not completely emptied*. Obviously, the larger the buffer, the more safety margin you have in case of interruptions. If your CD recorder has a very small buffer and your hard disk is slow, you may find it difficult or impossible to write virtual images directly to CD. Your options are (a) "Write First to Hard Disk" to make a real ISO image on hard disk and record from that, (b) buy a faster hard disk, or (c), if possible, get your recorder upgraded.

When to Write at Single Speed

Given all of the above, if you want to write a virtual image directly to CD and you have a slow hard disk, it is generally safest to write at 1x speed. If you have a CD recorder which forces you to write at 2x, in many situations it will be difficult to write a virtual image straight to CD. Your only choices are (a) make a "Write First to Hard Disk" image on hard disk and record from that, or (b) if possible, get your CD recorder upgraded.

When to Write at Higher Speeds

In most situations where your hardware configuration is adequate (fast, defragmented hard disk, few small files, good-sized recorder buffer), you can successfully write virtual images straight to CD. However, it's always advisable to test first.

About Recordable CDs

Care of Recordable CDs

Issues about the longevity and durability of recordable CDs are subject to lengthy and acrimonious debate. Here we distill some general principles:

- Don't expose discs to sun or other strong light for long periods. Also try to avoid high heat and humidity.
- Don't use alcohol-based pens to write on discs; the ink may eventually eat through the top (laquer) surface and damage your data. Don't use ballpoint or other sharp-tipped pens because you may scratch right through the laquer and damage your data.
- Don't put labels on discs unless they are expressly designed for recordable CDs. There are two reasons for this: the glue may each through the laquer surface just as some inks do, and/or the label may unbalance the disc and cause problems in reading it back or recording to it again. Never try to remove a label – you might tear off the lacquer and some of the reflecting surface.

Recordable Disc Brands

There are many different brands of recordable CDs available. Quality varies from brand to brand, and even from batch to batch within a brand. If you have repeated problems that can be traced to the blank media you are using, try using a different brand or even a different batch of the same brand.

Kodak Photo CD Discs

Kodak Photo CD discs are designed to be used only with Kodak Photo CD™ professional workstations. Although the discs are inexpensive, they have a protection bit which prevents them from being written on many CD recorders. When you attempt to write these discs on the recorders which recognize the protection bit, you will receive an error message.

Using 80mm (21 min) Discs

This size of CD is accepted by the CD recorder. Simply align the 80mm CD with the center of the tray.

Problems in Reading Recordable CDs

If you have successfully completed writing but cannot read the disc you wrote, there are several possible reasons. If the disc is multisession, see below for a discussion of problems in reading multisession discs.

CD-ROM Drive Incompatibility with Recordable CDs

Laser Calibration

Some CD-ROM drives' lasers were not calibrated to read recordable discs, whose surface is different from that of factory-pressed discs. If your CD-ROM drive reads mass-produced (silver) CDs but not gold CDs, check with the manufacturer to determine whether this is the problem.

Fast CD-ROM Drives

In order for some models to work as fast as they do, they must perform unconventional operations such as a laser calibration in the lead-out area to determine, by a voltage measurement, the approximate position of several tracks. It occasionally happens with some CD recorders that the session lead-out is not recorded completely correctly, causing problems when this area is used to calibrate the reading laser.

Related Topics:

[Problems in Reading Multisession Discs](#)

[Other Potential Problems](#)

Problems in Reading Multisession Discs

The most common problem encountered with multisession discs is not in recording them but in reading them back. This is because there is a great deal of confusion among users and even producers of CD-ROM technology as to exactly what multisession means and how multisession discs should be recognized and read.

The Problem

Multisession discs are recorded according to the Orange Book Part II standard, which states that they can be written in either the CD-ROM or CD-ROM XA physical sector format. It does not matter which; theoretically, you could even mix the two formats on one disc. Under the standard, when *any* disc is mounted in a multisession CD-ROM drive, it should by default look at the LAST session on the disc, no matter what format the disc is recorded in.

However, there have been misunderstandings and misinterpretations of the standard in some (if not all) parts of the CD-ROM industry, largely for historical reasons. Multisession recording was first implemented by Kodak for Photo CD, because one roll of film digitized in the Photo CD format does not fill up a disc. When you take your disc and a new roll of film to be Photo CD-ified, the new photos are added in a new session which is linked to previous sessions so that you can see *all* the photos on the disc, no matter how many sessions they are recorded in.

Kodak's choice of CD-ROM XA for its disc format had nothing to do with the needs of multisession; Kodak wanted to leave room for future developments of Photo CD which would be more easily supported in the CD-ROM XA format than in CD-ROM.

Because Photo CD was the first reason manufacturers had to create multisession CD-ROM drives, some of them assumed that the Kodak way to do multisession (CD-ROM XA) was the *ONLY* way. They accordingly wrote software drivers which assume that, to be multisession, a disc must *also* be XA. When one of these drivers sees a disc which is not XA, it assumes that the disc is also NOT multisession – and it tells the CD-ROM drive to read only the first session on the disc. The result is that a multisession disc is read as if it were a single-session disc, and you see only the data in the first session.

Most (maybe all) CD recording software, on the other hand, writes multisession discs in plain CD-ROM format, as allowed by the Orange Book standard. But multisession discs written in CD-ROM may not be read back correctly on all CD-ROM drives, including some which are fully Photo CD compatible.

Obviously, there's a communication problem between those of us who make software for CD recording, and those who make CD-ROM drives. Which results, unfortunately, in massive confusion for you, the end user.

The Solution

Most CD-ROM drive manufacturers have realized by now that they have a problem, and are coming out with new software drivers which support multisession reading in both CD-ROM and CD-ROM XA. If you write a multisession disc and cannot read it back on a multisession CD-ROM drive, this may be the problem. Contact your drive manufacturer for a software driver update. (Some models may need to be sent back to the manufacturer for a hardware upgrade.)

Other Potential Problems

SCSI Cables

Ensure that your SCSI cables are of good quality and working properly, and that the SCSI chain is correctly terminated.

CD Recording Software

Any software can sometimes produce incorrect tracks due to bugs or recording glitches. To check whether the incompatibility problems lie with the originating software or with one of the other causes listed above, test the same disc on several CD-ROM drives. If one drive can read the disc correctly, the problem is not the disc but one or more of the other factors listed.

MSCDEX Errors

Although MSCDEX will allow non-ISO legal characters in filenames, versions of MSCDEX prior to 2.23 have a problem in dealing with filenames which contain the hyphen. If a directory contains a filename with a hyphen in it, you will be able to see all the files by doing a DIR from DOS. But any files listed after the file with the illegal name are not accessible; upon trying to open then you would get a "file not found" message. MSCDEX 2.23 appears to have fixed this bug.

Potential Configuration Problems

SCSI Configuration

Does every SCSI device on your system have a different SCSI ID? Some devices are shipped set to SCSI ID 0, which is usually also assigned to the computer's internal hard disk. To change a device's SCSI ID, first turn off EVERYTHING. After changing the ID setting, restart your entire system – external SCSI devices first.

If the problem seems to be with the ASPI shell, reboot your computer and read the start-up messages to ensure that ASPI is being loaded correctly.

If you get the message "Bad ASPI Open," this generally means one of two things:

- The ASPI device driver on your hard disk is damaged. Recopy it from the installation floppy.
- You have no SCSI peripherals attached.

The CD recorder's position in the SCSI chain or the length of cabling between the computer and CD recorder may cause data slow-downs; try connecting the CD recorder as the first peripheral in the SCSI chain, and keep the cable short.

Check your SCSI cables. Cables which are damaged or not of good quality can cause problems. Too many SCSI peripherals on the chain can cause problems.

The Most Common Error Messages

Insufficient Disk Space

Write File Error

The drive with temporary files is full or damaged

SCSI request completed with error

Absorption Control Error

Application Code Error

Bad ASPI Open

Buffer Underrun No Write Data (Buffer Empty)

Data Overrun/Underrun

Disc Write-Protected

General Protection Fault

Invalid Logical Block Address

Read File Error

Write Emergency

Insufficient Disk Space

This happens when using the "Write to HD First" option, and the amount of data to be copied is greater than the free space on your local hard disk.

Write File Error

This is the same kind of error as "Insufficient Disk Space". (see above)

The drive with temporary files is full or damaged

Remove unused files and verify that your hard disk is free of errors with CHKDSK or SCANDISK.

SCSI request completed with error

The disc is in the process of loading, wait until it has loaded (a solid green ready light), then retry the operation.

Absorption Control Error

This most often means that there is a problem with the blank disc you are recording to, perhaps just a smear or speck of dust. Try cleaning it (on the non-label side) gently with a lint-free cloth. If the error occurs again, give up and use a new disc. Some brands of recordable CD give particular trouble with some models of CD recorder.

Application Code Error

Occurs when you try to write Kodak recordable CDs for Photo CD. These discs have a protection bit.

Bad ASPI Open

ASPI driver bad or missing. No SCSI devices found.

***Buffer Underrun
No Write Data (Buffer Empty)***

The flow of data to the CD recorder must be extremely regular so that its working buffer is never empty when it prepares to write a block of information to disc. This message indicates that for some reason the flow of data from hard disk to CD recorder has been interrupted. Also ensure that no screen savers or other TSR utilities are active which might momentarily interrupt operations, and that your working hard disk cannot be accessed via network.

The CD recorder's position in the SCSI chain or the length of cabling between the computer and CD recorder may also cause data slow-downs; try connecting the CD recorder as the first peripheral in the SCSI chain, and keep the cable short.

Data Overrun/Underrun

The SCSI host adapter reported an error. This is caused by improper termination or a bad SCSI cable.

Disc Write-Protected

This disc has been closed and can no longer be written to.

General Protection Fault

Using an Adaptec 152x SCSI host adapters, this error is caused by a problem in EZSCSI software version 3.0. Upgrade to version 3.1 or later.

Invalid Logical Block Address

This means the software has requested a block from the disk that does not exist or is illegal. This may happen with a corrupted hard disk.

Read File Error

A file referenced by the Dirs/Files List cannot be located or accessed. Ensure that it is not being used by you or by someone else on a network.

Write Emergency

This error occurs if the drive is interrupted during a write action. It is commonly seen when writing audio, but can also occur with data. One common reason for a write emergency is dust particles that cause the laser to jump off track.

Glossary of Terms

Access Time

ASPI

Buffer

Cache

Caddy

CD-R

CD-ROM

CD-WO

Data Area

Extension

File System

Gold Disc

ISO 9660

ISO Image

Lead-In

Lead-Out

Logical Block

Mastering

MSCDEX

Mount

Orange Book

PCA

PMA

Premastering

SCSI

Sector

Session

Table of Contents (Disc)

Track

Yellow Book

Access Time

The time it takes to retrieve a piece of information. With disks or discs, maximum access time is measured as the time it takes to move from one end of the disc to the other, find a piece of information, and transfer that information to RAM.

ASPI

Advanced SCSI Programmer's Interface. Set of software primitives and data structures which allow software using the ASPI interface to be SCSI host adapter-independent.

Buffer

An amount of memory which temporarily stores data to help compensate for differences in the transfer rate of data from one device to another.

Cache

A portion of RAM used for temporary storage of data which must be very quickly accessible. In CD-ROM applications, the cache is typically used to store directory files.

Caddy

The plastic and metal carrier into which a CD must be inserted before it is loaded into some CD-ROM drives or CD recorders.

CD-R

Compact disc-recordable. Also known as a gold disc.

CD-ROM

Compact Disc-Read Only Memory. A standard for compact disc to be used as a digital memory medium for personal computers. Jointly developed by Sony and Philips and launched in 1985, the specifications for CD-ROM were first defined in the Yellow Book.

CD-WO

Compact Disc-Write Once. Recordable compact disc. These systems allow information to be written by laser onto a special pre-grooved disc (a disc with grooves inscribed for the data spiral to be written onto) and read back many times. Writing may occur over one, or more than one, session or "recording action." When writing is complete, including a table of contents, the disc may be read back by any CD player. Some specially-adapted CD-ROM drives can also read the disc before the table of contents is written. The CD-WO specification is defined in Part II of the Orange Book.

Data Area

In ISO 9660, the space on a CD-ROM where the user data is written. It begins at the absolute or physical address 00:02:16, immediately following the System Area.

Extension

A small program which can be "plugged into" a larger one, usually to enhance the main program's capabilities.

File System

A data structure that translates the physical (sector) view of a disc into a logical (files, directories) structure, which the application and user can more easily use to locate files. See also Logical Format.

Gold Disc

The recordable disc used in CD-WO systems. The blank disc is made, like all other compact discs, of a bottom layer of polycarbonate, but instead of having a series of pits and lands stamped into it, it contains a preformed track spiral, which the recording laser beam will follow when inscribing information onto the disc. This type of disc is therefore called pre-grooved. A translucent green layer of recordable material is laid on top of the polycarbonate, then a reflective layer of gold. Then the usual layers of lacquer and label are applied.

ISO 9660

An international standard specifying the logical format for files and directories on a CD-ROM.

ISO Image

Or CD-ROM image, image, disc image. A single large file which is an exact representation of the whole set of data and programs as it will appear on a CD, in terms of both content and logical format.

Lead-In

An area at the beginning of each session on a recordable compact disc which is left blank for the session's Table of Contents (track numbers and start-and-stop points). The lead-in is written when a session is closed, and takes up 4500 sectors on disc (1 minute, or roughly 9 megabytes). The lead-in also indicates whether the disc is multisession, and if the disc is not closed, which is the next writeable address on the disc.

Lead-Out

The area at the end of a session which indicates that the end of the data has been reached; there is no actual data written in the lead-out. The first lead-out on a disc is 6750 sectors (1.5 minutes, about 13 megabytes) long; any subsequent lead-outs are 2250 sectors (.5 minute, about 4 megabytes).

Logical Block

The smallest addressable space on a disc. Each logical block is identified by a unique Logical Block Number (LBN), assigned in order starting from 0 at the beginning of the disc. Under the ISO 9660 standard, all data on a CD is addressed in terms of Logical Block Numbers. At present, CD recording is supported at one Logical Block per logical sector.

Mastering

The process of creating a glass master from which compact discs will be reproduced. Data is read from a tape or recordable CD to a powerful modulated laser beam that "engraves" the corresponding pits into a photoresistant surface. In CD-WO systems, mastering is done by the desktop CD recorder.

MSCDEX

Microsoft DOS extensions for CD-ROM. Allows the DOS operating system to recognize a CD-ROM as a DOS volume.

Mount

To install a compact disc so that the computer recognizes its presence and can read data from it.

Orange Book

The Philips/Sony specification for Compact Disc Magneto-Optical (CD-MO) and Write-Once (CD-WO) systems.

PCA

(Power Calibration Area). A space reserved at the beginning of the disc for calibrating the laser to record to that disc.

PMA

(Program Memory Area) On a recordable disc, an area which "temporarily" contains track numbers and their starting and stopping points (that is, the session Table of Contents) when tracks are written in a session which is not yet closed. When the session is closed, this same TOC information is written in the session lead-in.

Premastering

The process of preparing data to be recorded onto a compact disc. This includes breaking the data into sectors and recording those sectors with the appropriate header (address) and error correction information. In the case of recordable CD systems, premastering and mastering are done in one operation, resulting in a ready-to-read compact disc.

SCSI

Small Computer System Interface (pronounced "scuzzy"). An interface which allows up to eight devices to be linked to a single controller.

Sector

The smallest recordable unit on a CD. A disc can contain $[(75 \text{ sectors per second}) \times (60 \text{ seconds per minute}) \times (\text{number of minutes on disc})]$ sectors. The amount of data contained in the sector depends on what physical format and mode it is recorded in; for "regular" CD-ROM (Mode 1) data, you can fit 2048 bytes (2 kilobytes) of data into a sector.

Session

As defined under the Orange Book, a recorded segment of compact disc which may contain one or more *tracks* of any type (data or audio).

Table of Contents (Disc)

Shows the number of tracks, their starting locations, and the total length of the data area of the disc.

Track

Every time you write to CD, you will create at least one track, which is preceded by a pre-gap and followed by a post-gap. Any session may contain one or more tracks, and the tracks within a session may be of the same or of different types (for example, a mixed-mode disc contains data and audio tracks).

Yellow Book

The book which sets out the standard developed by Philips and Sony for the physical format of compact discs to be used for information storage.

A real ISO image is a single large file containing all the data to be written to CD, already premastered into CD sectors and ready for streaming to the CD recorder,

