

IsoBuster Features

IsoBuster is The Ultimate CD/DVD data recovery tool !

Rescue lost files from CD or DVD !

Save important documents, precious pictures from the family, your only system backup, ... IsoBuster can do it all.

IsoBuster features :

- [Data recovery](#) from CD and DVD.
- Better Error handling and several retry-mechanisms to aid you in getting the data anyway.
- The use of alternative ways to get to the data, get the best out of your CD/DVD-ROM drive.
- The use of alternative File-Systems to get to the data, make use of all content.
- CDs stay 'readable' after problems (such as Buffer Under-run).
- Read and Extraction of files, CD/DVD images, tracks and sessions from all optical media.
- Supports : CD-i, VCD, SVCD, CD-ROM, CD-ROM XA, CD-R, CD-RW, ...
- Supports : DVD-ROM, DVCD, DVD-RAM, DVD-R, DVD-RW, DVD+R, DVD+RW, ...
- Mpg (*.dat) Extraction and dat2mpg 'in one'.
- Enormous File System coverage and ways to use them all (find the best one for your needs) :
 - ISO9660, Joliet, Romeo (Short File-names <-> Long File-names on mastered CDs)
 - Big Endian (Motorola), Little Endian (Intel) (Windows vs. Unix, Mac and other systems' defaults)
 - UDF 2.01 but also : UDF 1.02 (e.g DVDs), UDF 1.5 (e.g. Packet writing on CD-R and CD-RW)
 - Rock Ridge (e.g. for Commodore users)
 - Information on and File system properties (must for FS developers)
- Scanning for lost UDF files and folders.
 - Find lost data on CD or DVD created with drag and drop applications (Direct CD, InCD, DLA, Instant-Write, ...)
 - Find lost pictures created and saved to CD with Mavica or other digital cameras.
 - Auto find extensions based on file content to try and give an appropriate name to an orphaned file.
 - Support for Direct CD compressed files.
 - Support for blanked DVD+RW media.
- CD/DVD Surface scan to see if there are physical read errors.
- Check if all files and folders are readable without having to extract to HD.
- Single sector extraction. Extraction of CD/DVD parts, fit to your needs.
- Sector Viewer. Check a sector's content in IsoBuster's editor and print or save to HD.
- Compile (and edit, save, print) lists of all files that contain physical read errors.
- Compile lists of all files, including their Logical block address (ideal to find the logical play order for mp3 CDs)
- [CD-Text](#) support from CD and *.PXi image files.
- Many other neat features the OS doesn't offer
- Comprehensive help file
- Supports an enormous range of image files (see further)
- ...

On top of this, IsoBuster interprets CD image files, such as :

*.DAO (Duplicator), *.TAO (Duplicator), *.ISO (Nero, BlindRead, Creator), *.BIN (CDRWin), *.IMG (CloneCD), *.CIF (Creator), *.FCD (Uncompressed), *.NRG (Nero), *.GCD (Prassi), *.P01 (Toast), *.C2D (WinOnCD), *.CUE (CDRWin), *.CDI (DiscJuggler), *.CD (CD-i OptImage), *.GI (Prassi PrimoDVD), *.PXI (PlexTools).

IsoBuster now features Language support for 35 languages :

- English, Dutch, Italian, French, Spanish, Portuguese, Brazilian Portuguese, Chinese (Simplified), Chinese (Traditional), Czech, Danish, German, Icelandic, Greek, Serbian, Finnish, Polish, Romanian,

Swedish, Russian, Azerbaijan Turkish, Hebrew, Bulgarian, Hungarian, Slovakian, Afrikaans, Norwegian, Ukrainian, Catalan, Slovenian, Lithuanian, Japanese, Galician, Estonian, Turkish & Farsi. More Languages will follow.

IsoBuster PRO

Starting from IsoBuster version 1.0 there's now the possibility to register a **PRO** version.

This does not mean that you need to download another version after registration.
The normal IsoBuster download can be changed to a PRO version.
Just unlock the PRO functionality with a Serial Key and Registration ID.

[How to purchase a license and unlock PRO functionality.](#)

PRO functionality unlocks high end data recovery from [UDF](#) CDs (And Image Files).
UDF is the [File System](#) used by Packet Write Applications such as Direct CD, InCD, Packet CD, DLA,
UDF is also used on DVD and the occasional normal CD (next to other File Systems)
UDF is the preferred File System to be used with [Mount Rainier](#).

How to Register PRO functionality

Registering IsoBuster to get a **PRO** version is easy.

Via Credit Card :

- Click <http://www.smart-projects.net/buyisobusternow> which will bring you to the Secure Online Pay site.
- An IsoBuster registration costs \$20 which is a small price for a powerful application ! If you choose any of the amounts smaller than \$20, no registration will be processed. However, feel free to select more than one product (\$20 included !) if you feel IsoBuster is worth more to you.
- Once you have payed with your credit card, an automated script will send you a Registration ID and Serial number within a few minutes. The confirmation Email will contain (a page full of) credit card payment information and next (**so scroll down**) the registration ID and Serial number, along with useful information (Location of next beta version, Help, ...). (Allow for a few hours delay in extremes but notify IDDelayed@Smart-Projects.net when it takes more than 6 hours !)

Via Mail (snail-mail) :

- Send an Email to SnailMail@Smart-Projects.net with Snail-Mail-Pay-Request in the subject line of the mail.
- Smart Projects will respond in the next 24 hours with a postal address to send the money to. The address is still not final yet, so no address can be mentioned in this help file.
- Prepare a letter to send to the address which was sent to you and include a 20 Euro or 20 USD bank note or cheque in the mail together with a small letter which mentions your Email address (don't forget your Email address).

You will receive a Registration ID and Serial number within the next 5 days.

Once you have received the Registration ID and Serial number via Email :

- If you start IsoBuster for the very first time you will get a registration dialog automatically.
- If you already started IsoBuster 1.0 or higher (and chose Free Functionality or Remind me later), Select Registration in the main menu (About / Registration)
- In the registration Dialog's Edit boxes : Type in (or better yet : copy / paste from this mail) : the Registration ID and the Serial number.
- Click the Register >> button and you will unlock PRO functionality. As of now, this version will stay unlocked on your system.

[Problems Getting IsoBuster registered](#)

Problems Registering IsoBuster Pro

I Cannot connect to the Online PaySite ?

Are you sure you are connected to the internet ?
Possibly the site is down ?

Please try again in a little while !

I entered the Registration ID and Serial Number in the Registration dialog but the Register button stays disabled ?

A safety check in IsoBuster makes sure the Registration button only becomes active when the Registration ID and Serial Number 'agree with each other' in a certain mathematical way. This is to make it obvious to the user that incorrect data was entered so that the error can be corrected.

Both the Registration ID and Serial Number have to be entered IDENTICALLY to what was sent to you via Email.

The easiest way is to copy and paste the content. (See further if you wonder what is meant with 'copy' and 'paste')

Both the Registration ID and Serial Number are caps sensitive.
Make sure both the ID and Serial do NOT contain any trailing blanks !
E.g. a blank character at the end may not be spotted immediately
but will prevent the Registration button from appearing.

The ID :

Do not enter only part of the ID. You need to enter the complete ID which is typically a combination of your Email address and the Kagi registration ID, fused together with an underscore '_'. E.g.
YourName@EmailDomain_KagiID

Some Email clients highlight the ID because it contains an Email address. Don't let it confuse you, just select the complete ID and copy it in the appropriate registration box.

The Serial :

Is ONE word and needs to be entered as such.
6 times 8 characters, separated by '-', so a total of 53 characters.

I entered the Registration ID and Serial Number in the Registration dialog, I clicked the Registration button but got a message saying the Key is incorrect !?

Apparently the ID and Serial Number you entered passed the first safety but are nevertheless still incorrect !

Both the Registration ID and Serial Number have to be entered identically to what was sent to you via Email.

The easiest way is to copy and paste the content.
(See further if you wonder what is meant with 'copy' and 'paste')

Both the Registration ID and Serial Number are caps sensitive.
Make sure both the ID and Serial do NOT contain any trailing blanks !
E.g. a blank character at the end may not be spotted immediately
but will prevent the Registration button from appearing.

You say, 'Copy' and 'Paste' the Serial key in the Windows Edit Box control but Paste doesn't work ?

It does, really ! If no popup window appears in the Edit Box control when you right mouse click on it you will have to use the standard Windows key combination to copy and paste !

Select the Key in the Email. Press both keys 'ctrl' and 'c'. The selection is now copied to the Windows clipboard.

Position the cursor in the Serial Key Edit Box and press both keys : 'ctrl' and 'v'.

You now copied the content from the clipboard in the Edit Box control (in other words 'Paste').

If still no success, contact CannotRegister@Smart-Projects.net

IsoBuster on the Web

IsoBuster can always be found here : <http://www.isobuster.com>

or :

<http://www.isobuster.net>

<http://www.isobuster.org>

<http://www.isobuster.biz>

<http://www.isobuster.info>

To get the most recent, virus free, official build, always go through this website !

IsoBuster is a product of [Smart Projects](#). Starting from this URL is of course also a good idea !

Furthermore IsoBuster is hosted by a number of other sites. I've lost track but it is in the order of 100 - 500 (?)

If you would like to link to IsoBuster directly rather than going through the IsoBuster site, make sure you use the official download links. They are redirectors to different locations but at least when a file changes location, the redirectors are always updated !

However, I do appreciate sending people via the official website ! Then at least I have a feel for the actual downloads.

<http://www.isobusterdownload.com/IsoBusterDownloadFileName>

<http://www.isobusterdownload.net/IsoBusterDownloadFileName>

<http://www.isobusterdownload.org/IsoBusterDownloadFileName>

<http://www.isobusterdownload.info/IsoBusterDownloadFileName>

<http://www.isobusterdownload.biz/IsoBusterDownloadFileName>

Looking for references is easy, just use [Google](#) !

The Author can always be reached : Peter@Smart-Projects.net

Version History

IsoBuster 1.4

New

- Sector Viewer
 - Ability to look at every individual sector and see the content (normal or raw)
 - Ability to save as *.rtf or *.txt file
 - Ability to print every sector content
- Support for Pinnacle Image files (*.PDI)
- Map Erroneous sectors during scanning for lost UDF files and folders.
- Indicate if files contain errors or not after scanning.
 - By means of a list
 - By means of an extra icon next to every file
 - Extra options to request that list
- Auto-scan function to find extensions for orphaned (nameless) files after UDF scan
- CD/DVD Surface scan routine to find physical errors.
- Check if all files are physically readable without having to extract them somewhere.
- The CD/DVD icon now also nicely mentions if the media is : DVD-R, DVD-RW, DVD+R, DVD+RW or DVD-RAM
- CD/DVD Properties Window shows amount of layers.

Improvements

- UDF file improvement for Pioneer CE player created VR discs.
- Take in account badly mastered UDF with dead loop directory references (e.g. DirA contains DirB contains DirA again)
- Improve robustness and implement workarounds for corrupt UDF systems containing bogus data in certain critical fields.
- More logging features default enabled to do analysis.
- Small changes for future devices (cfr. more recent MMC specifications)
- Small GUI improvements.
- Sanitising data after scanning for lost UDF files or folders speeded up in case the directory data contains many errors.
- Improvement to not conflict with certain card reader drivers under Windows 2K and XP

Bugfixes

- Switching between SPTI and ASPI could cause problems under WinXP and Win2K.

IsoBuster 1.3

New

- Full *.PXi (Plextools) image file support (multiple tracks, multiple sessions, CD-Text, ...)
- Roxio Compressed UDF format supported.
- Drag and Drop (drag image files to the TreeView (left pane), drag files from the ListView (right pane) ...)

Improvements

- Tray Open/Close detection (for newer MMC3 compliant devices)
- Start up Maximized displays the form properly all the times.

BugFixes

- Extraction of Audio tracks from certain image file formats was not always done correctly.

IsoBuster 1.2

New

- Full Surface scanning function to find missing and/or deleted files on UDF written CD-R, CD-RW, DVD+R, DVD+RW, DVD-R and DVD-RW.
 - Activated per session.
 - Find all previous states (older file versions) of the File System on sequentially written media (CD-R, DVD+R, DVD-R)
- Support for *.pxi image files (still limited support but will improve).
- Set your own retry-count during CD access (in case of many (long lasting) read errors)

Improvements

- Improvement for DVD-R open session (length detection)
- Improvement for new variant of *.cdi image files (possibly generated by a new CD-Rom filter driver ?)

BugFixes

- Small bugfixes (e.g. GUI but not that anybody ever noticed)

IsoBuster 1.1

New

- Help file integrated in installation
- F1 for help

The all languages installation features 31 languages, some of which are updated (e.g. Russian)
New languages : Galician, Turkish, Farsi

Improvements

- Improvement for DVD+R open session (length detection)
- Improvement for CDRW formatted track (length detection)
- Improvement for reserved tracks (No File System scanning)
- UDF (By Direct CD) is now also found in open DVD+R, DVD-R sessions
- Compensation for UDF conflict against the specifications (Bug by InCD)
- Compensation for UDF conflict against the specifications (Bug by Padus, files > 1 GB)
- Registration dialog accepts slightly wrong IDs and Serials to make it easier.
- Added raw data extraction from image files that contain less data (IsoBuster adds EDC/ECC)
- Improvement for extraction of M2F2 mpg video from none raw image files.
- Small changes in the UDF engine, getting ready to implement some cool scanning routines.

Bugfixes

- Improvement for *.cif end of file detection.
- Some complex UDF layouts were not always displayed in the right pane (TreeView object)
- Rock Ridge file names were sometimes ISO9660 File names (so, no long file names)
- CD-i directories not always detected as directories but seen as files.
- Rare crash during mounting UDF file-system (I don't think anybody ever ran into this one ?)

IsoBuster 1.0

- Improved handling of DVDs in DVD-Writers (DVD-R/W and DVD+R/W)
- Improved handling of Multi-border DVD-R/W
- Improved handling of Multi-Session DVD+R
- Ability to Register, Buy Online, Remind me later ... (Registration Dialog added)
- Ability to Extract UDF files and folders (Once the version is registered)
- *.GI (Prassi PrimoDVD) Image file support
- Bug-fix : Date and time was not always correctly displayed
- Bug-fix : for some images (Apple icon indicated Mac content) not all files were shown (only occurred in very specific and rare occasions)

IsoBuster 0.99.9

- CD-Text
- UDF 2.01 (so also UDF 1.02 (e.g. DVDs, Mount Rainier, ...) and UDF 1.5 (e.g. packet writing on CD-R and CD-RW))
- Optimage (Philips, CD-i) image file support.
- Drive properties
- Improved detection of scrambled data image files.
- Worked around a Win95 issue that caused IsoBuster to not start up on Win95 systems with IE < 4.0
- All sorts of small suggestions implemented (= General improvements)
- Ukrainian language support.

IsoBuster 0.99.8

- Rewrite to Full Unicode support (internally) (Getting ready for the future)
- Code Page selection for MBCS and SBCS conversions
- Charset feature support (transparent to the user) which deals with font settings to be able to support Oriental languages properly
- *.cif and *.cue image file support.
- Improvements to be better support certain border case image file formats.
- Improvement to better support audio extraction on old SCSI drives.
- Improvement to better deal with older (incorrectly TOC reporting) DVD-ROM drives.
- Added language support for : Japanese, South-African (Afrikaans), Norwegian.
- Most of the existing language- have been polished and updated !

IsoBuster 0.99.7.5

- Improved File handling to be able to deal with +2GB files (think DVD). This also means better handling of +2GB image files.
- Improved handling of +2GB DVDs. This change is very much tied in to the first improvement but not exactly the same. Before, the capacity (track-size, session-size, ...) could be reported incorrectly.
- Fix for 05/64/00 'Illegal mode for this track' error with some 2K/block image files.
- Minor tweaking, e.g. IsoBuster will now allow a file with illegal name (according to the OS) to be extracted.
- The installation now installs a few more languages :
Dutch, Italian, French, Spanish, Portuguese, Brazilian Portuguese, Chinese (Simplified), Chinese (Traditional), Czech, Danish, German, Icelandic, Greek, Serbian, Finnish, Polish, Romanian, Swedish, Russian, Azerbaijan Turkish, Hebrew, Bulgarian, Hungarian & Slovakian.

IsoBuster 0.99.7.4

- The change vs. 0.99.7.3 is small but a very interesting one !
I found that some CDs (and thus also image files) have wrongly mastered Iso/Joliet File-Systems.

Not that this is the first time I see ugly situations in File-Systems, but this is one that will (and does) cause applications and File-System drivers to make grave mistakes with missing files and directories as a result. The problem does not occur on my Windows 98 system and I guess that's the reason why this nasty file-system generator could be released in the first place. I strongly suspect one certain company but I have no immediate prove so I will not mention the company (which Btw. I have seen make mistakes in this area before).

To test my suspicion that this error must cause missing data on some systems or with certain applications I tested with several Windows apps which in some areas overlap IsoBuster functionality ! The ones I tested ALL failed !! I did not necessarily test the latest versions but I suspect (at least some of them) will still have this problem.

IsoBuster 0.99.7.4 deals with this problem.

- The installation now installs a few more languages : Dutch, Italian, French, Spanish, Portuguese, Brazilian Portuguese, Chinese (Simplified), Chinese (Traditional), Czech, Danish, German, Icelandic, Greek, Serbian, Finnish, Polish, Romanian, Swedish & Russian.

IsoBuster 0.99.7.3

- The change is minimal. Some small changes to better meet certain localisation !
- The installation now installs : Dutch, Italian, French, Spanish, Portuguese, Brazilian Portuguese, Chinese (Simplified), Chinese (Traditional), Czech, Danish, German, Icelandic, Greek, Serbian & Finnish.

IsoBuster 0.99.7.2

- Full Multi-Language support (already included : Dutch, Italian, French, Spanish, Portuguese, Brazilian Portuguese, Chinese (Simplified), Chinese (Traditional), Czech, Danish & German).
- All wrapped in a nice installation (installing the languages, providing file extension registration, icons etc. ...)
- Improvements : Time-stamps for folders, remembering the last 'saved to' folder.
- Bug Fixes : Opening large folders (e.g. i386 folder on XP CD (5300+ objects)) sometimes could result in unstable behaviour.

IsoBuster 0.99.7.1

- This version is based on a totally new engine.
Yes ... I re-wrote the code once again ... but this time I'm happy !!!! ;-))
It took me half a year but I think I have some nice Object Oriented code now.

Version 0.99.7.1 looks (VERY) similar to version 0.99.6
Although not easy to spot there are some major changes and improvements in this version already.
(Engine stuff which isn't spotted that easily, e.g. also in command sequences to drives etc.)

I try to list the changes :

- Even better supports for some CDs that were previously unreadable
(e.g. some incomplete sessions / tracks which could not be seen with previous version) !
- Far better support for DVD !!
- Multi-Track extraction
- (Hopefully) made it more clear what the differences are between User Data / Raw data (e.g. added Raw to User)
- Different extraction techniques.
- Made distinction between normal extraction (CD/DVD, sessions and tracks) and to Image Extraction.

- Open Image files starting from *.* instead of having to pick the image file type all the time.
- Support for Creator 5 image files.
- Ability to open an unlimited amount of Image files at the same time !
- Several more (smaller) changes ... I forget what they are !

IsoBuster 0.99.6

- System Icons
- Correct time indication (Previously all 'Modified' times were AM)
- Correct time of extracted files.
- From-To Extraction (choose the start and end position yourself, great for 'engineering jobs')
- Rock Ridge Support (Rock Ridge is an extension to ISO and was used a lot on Sun, Amiga and other computers)
- Track/Image Extraction enhancements (choose how to replace an erroneous block etc. ...)
- Several Modifications and Implementations to get ready for future functionality (EDC/ECC generation, better object oriented code (more improvements still to come in later version).
- Work around a few more Iso-mastering bugs of some write applications. (Damn these guys make mistakes ... especially in the part that IsoBuster uses but Microsoft doesn't (Big Endian)).

IsoBuster 0.99.5

- Port to BCB 5
- Re-Write of code (as a result different processes can run simultaneously, although internally properly queued as IsoBuster is not multi-threaded.).
- Complete Track and Session awareness. You are now able to explore file systems in the several sessions and have access to files and folders you long thought were lost.
- The internal File-Image handling has changed such that many variants of image files are still recognised. Added *.p01 image-file support (Gear), Added *.c2d support (WinOnCD).
- Full Win2K support.
- Under WinNT (4 or 2K), two ways of communication are now possible through the NT native SPTI layer or through Aspi.
- Track and Image extracting
- Extra support for CDTV CD owners
- A Mac icon is showed when a Mac ISO file-system is found
- Play Audio of Audio tracks.
- Work around NT 4 buggy atapi.sys driver problem (before Service Pack 4 or 5).
- Work around NT 4 bug in SCSI pass through mechanism (only when DMA on for IDE devices)
- Made sure IsoBuster works well with the Nero wnaspi32.dll for NT.
- Made some display improvements to better support the Windows 'Large fonts' setting.
- Added sort functionality. Sorting the LBA, Size or Name button.
- Added a feature to extract the directory list to a file which also mentions the block addresses.
- Audio tracks can be extracted to wave files
- 'Ignore All following errors' and 'Overwrite all files' when lots of errors are encountered during extraction.
- IsoBuster accepts command line parameters. Start IsoBuster with an Image file directly loaded.
- Properties for Files; Directories, Tracks, Sessions, ...
- More Bootable CD-ROM support. The 'El Torito' information is made available and the image can be extracted. Turn to other tools to edit
- A 'Run' option next to the extraction options

IsoBuster 0.99.4

- Support for the latest Clone CD (*.img) image files (which was changed a little bit).
- Added Nero (*.nrg) image support. (Only little testing done, input is welcome)
- Added Prassi (*.gcd) image support (Only single track images)

IsoBuster 0.99.3

- Support for Long File names (interpretation of Joliet file system)
 - Automatic de-scrambling of raw data delivered by some old CD-ROM drives
 - Support and minding for extended attribute lists (not seen yet)
 - Support for ISO converted UDF CD-R discs
 - Recognition of C32 CDs that are slightly out of spec.
 - Bug Fixes:
- On older SCSI readers when an error persistently occurred on a sector address above 65.000, IsoBuster sometimes returned incorrect data.

IsoBuster 0.99.2

... Change note Lost in space ... Not Even IsoBuster can retrieve the data now ... ;-)

IsoBuster 0.99.1

- IsoBuster now supports A LOT more SCSI drives !
- Modified field now shows data correctly (all the time)
- Few Memory allocation improvements. App now uses even less memory.
- Less critical in case of ISO format which is 'out of spec'.
- Some cosmetic improvements
- Support for two more ImageFiles: *.IMG (Clone CD) & *.CIF (Creator, single track images)

IsoBuster 0.99 << First Release >>

IsoBuster is a CD/DVD utility which lets you explore a CD File System while by-passing Windows. Here are the main features:

Better Error handling and several retry-mechanisms to aid in getting the data anyway (or at least partially).

More CDs stay 'readable' after problems (such as Buffer Underrun)

Read and extraction from CD-i, VCD, SVCD, CD-ROM, CD-ROM XA, DVD, DVCD,...

MPG (*.dat) Extraction and dat2mpg 'in one'.

And it supports the *.DAO, *.TAO (Duplicator), *.ISO (Nero, BlindRead, Creator) & *.BIN (CDRWin) CD Image types

Installation

- [Download IsoBuster from the Web.](#)
- [Get a registration key](#) (If you want the high end **PRO** stuff)
- **Unpack** the installation file. Most likely you downloaded a .zip file or a .rar file. Both .zip and .rar are compressed archives and you need to unpack the content before you can use it. For more information, look for Winzip (www.winzip.com)
- Once the installer executable file is unpacked, **run** it (double click the file)
- The IsoBuster **Installation** wizzard will guide you through the process.
- When you are asked if you want to **register file extensions**, "Which file types do you want associated with IsoBuster", Check the Image File types you want IsoBuster to open automatically. The File Types you have checked will automatically open in IsoBuster if you double click them. (E.g *.bin, *.iso, *.cif, ...)
- Create a Desktop **icon** will leave a shortcut on your desktop
- Create a Quick Launch **icon** will place a shortcut in the bottom right corner of the Windows taskbar (default position)
- Finish the installation and start up **IsoBuster** if you want.
- IsoBuster will ask you to enter the ID and key on first startup. if you purchased a key you can do this now. Else select "Remind me later" or "Free Functionality only".

For Your Information :

- An IsoBuster installation does NOT require you to reboot the system !
- An IsoBuster installation does NOT load any special drivers and does NOT copy files to any other directory than the directory in which you chose to install IsoBuster.

Development

IsoBuster is a product of Smart Projects, owned by Peter Van Hove, CEO, CTO,

IsoBuster is developed entirely via Borland C++ Builder.

The knowledge it contains is largely gathered from experience, while working for a major player in the optical industry.

Specifications that have helped me implement the capabilities (to a certain extent) can be found here :

<http://www.ccs.neu.edu/home/bchafy/cdb/info/info.html>

<http://www.ecma.ch>

<http://www.unicode.org>

<http://www.osta.org>

Furthermore, and not that I really had to use them, afterall this stuff is my cup of tea, I also want to share some good CD knowledge resources.

Andy McFadden and Mike Richter have written some great online FAQs :

<http://www.cdrfaq.org>

<http://www.mrichter.com>

File Locations

In theory you never need to bother about this.
The [IsoBuster installation wizard](#) does it all for you.

What **is** interesting is the following maybe,
In the directory in which you installed IsoBuster, a directory called 'lang' was created.
This directory contains all the language plug-ins that are installed via the installer.

Suppose you want to install a later version plug in for your language (e.g. you noticed on the [website](#) that there's a later version Your_language.dll available). If you have downloaded this more recent version you can simply copy the dll in the lang directory.
If the file already exists, just copy over it.
If Windows complains the file is in use, shut down (all running copies of) IsoBuster, and try again.

Awards and Testimonials



www.wintotal.de



www.pctip.ch



www.chip.de



www.softnews.ro



www.pcplus.co.uk



www.zdnet.de



www.cnet.com



www.lockergnome.com

And lots and lots more ... I didn't find the time to grab all the screenshots ;-)
You're welcome to send me small screenshots if you encounter them.

Starting with IsoBuster

Using IsoBuster is in fact easy.
You just need to know a few things :

- Scanning a CD / DVD / Image File layout and **File-System(s)** is done automatically, once the device is selected.
- Actions are triggered by selecting an object (**track**, file, directory, ...) and clicking the right mouse button.
- IsoBuster is many tools in one, don't let it confuse you. E.g. don't go creating an image file if you just want to recover data etc.

When you select a drive or an image file, the CD / DVD in the drive or the image file will be scanned automatically.

The content will be listed immediately, the session(s), track(s) and file-systems.

If you don't see anything, it means IsoBuster could not detect anything **or** the device is still mounting the media.

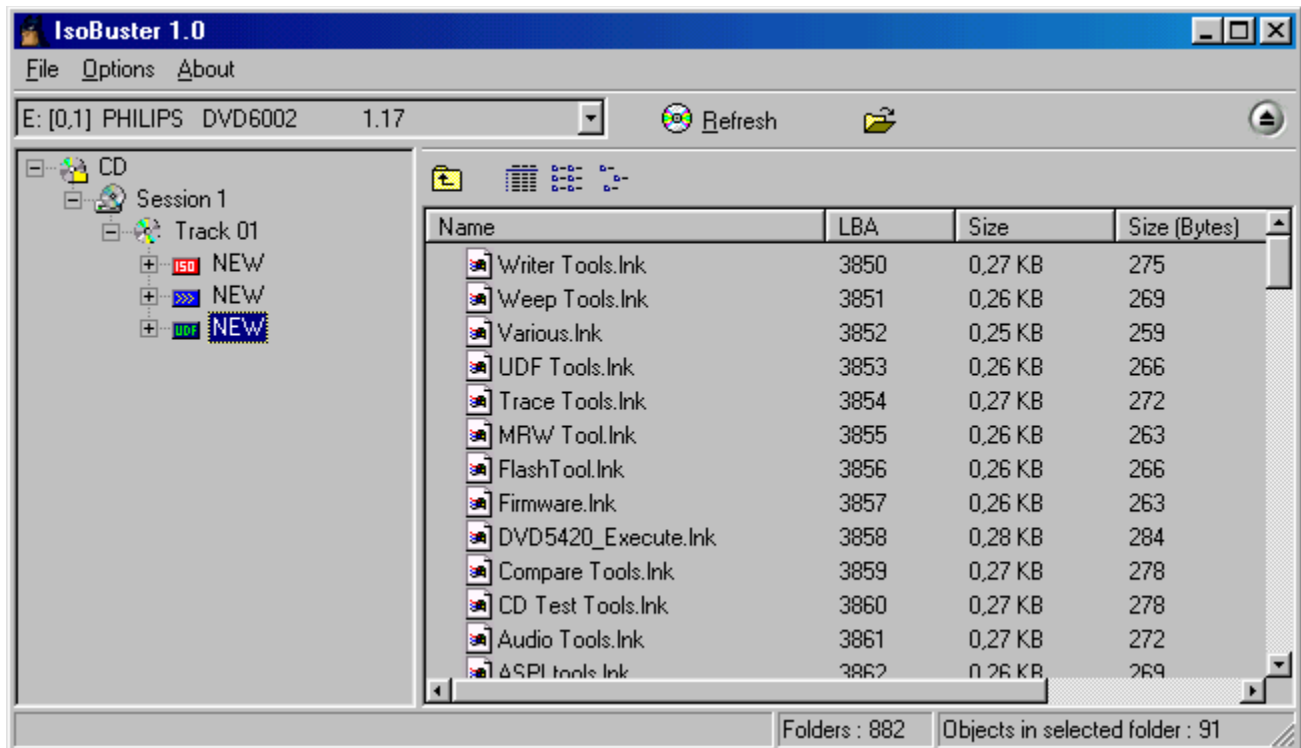
In case of the latter, wait till the media is mounted properly by the drive.

In most cases you can monitor this by looking at the LED behaviour of your CD/DVD drive.

There are cases when the CD / DVD reader will not mount media anymore because it is beyond recognition !

If the drive doesn't mount the media, IsoBuster will of course also not be able to access the media.

An examples of what you **can** see :



[For more information on track and session layouts.](#)

[For more information on File Systems, what are they, why different but identical ones, ...](#)

[For more information on Image Files.](#)

Select Drive / Image File

- To select a drive you simply have to use the drop down box on the top left-hand side. All the devices found during the system scan are listed there.
- To open an image file, click on the Open Image File button in the toolbar.



- Once an image file has been opened, a virtual device will be added to the drop down box on the top left-hand side. The virtual device stays active and the image file stays loaded even when you switch to another device in the drop down list. Only if the image is closed will the virtual device be removed again. You can open an infinite number (system resources limited) of image files at the same time. Each time you open an image file a new virtual device will be added to the drop down list. You can then switch between image files by just selecting the preferred one via the drop down box.
- [More on Image Files.](#)

Extract Options

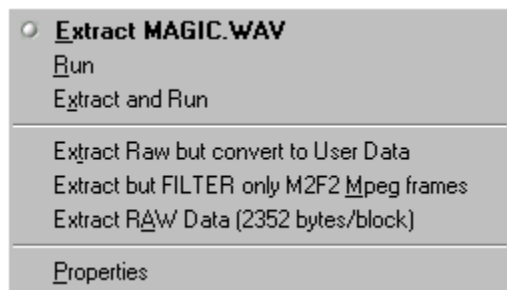
Extraction of a file, directory, CD/DVD as image file, ... is easy !
Just select the object you want to extract, right mouse click and choose Extract.
In most cases the best choice is the choice offered in **bold**.

IsoBuster knows several extraction methods and they also slightly differ from object to object.
But like said, choose the Extraction method in bold and chances are you get what you wanted.

If you're a bit confused about the term 'extract' you could also see it as :
Copy from the CD, DVD or image file to another location (e.g. your Hard Drive)

Still, it is wise to read this through at least once to understand the possibilities.

Extraction methods :



Extract

This will extract **files and folders** like they are meant to be extracted.

Only the '[user data](#)' portion per block is saved to the files as the CD/DVD-ROM device is instructed to only deliver this data.

Files extracted in this way can be opened like any other normal file

In some cases IsoBuster decides to actually use 'Extract but convert to User Data', but this happens seamless and you shouldn't worry about this.

Extract User Data

This is actually the exact same mechanism as described in 'Extract'.
(See above)

Extract Raw but convert to User Data

This method will extract all blocks [Raw](#). This means that the CD/DVD-ROM drive is instructed to not only deliver the [user data](#) portion per block but also to deliver the complete Raw block. IsoBuster (instead of the drive) will then decide on the [mode](#) and extract the correct user data portion per block.

The resulting files and folders will be the same as if you extracted them normally ('Extract')

Extract but filter only M2F2 Mpg frames

This extraction method should **only** be used if you suspect certain tracks or folders contain Mpg Video Data in [Mode 2 Form 2 sectors](#),
and if it is the Video Data you're after.

This kind of Video Data can be found on [VCD](#), [SVCD](#) and [CD-i](#).

In fact, this option is what other smaller and dedicated apps call 'dat2mpg'.

You can extract a *.dat file from a Video CD like this and end up with the pure mpg video data, without the overhead Windows extracts (if it even works under Windows). This 'clean' Video you need when you want to use the mpg data as input for your own Video CDs.

If you use this method in an [Image File](#), the image file will need to be recorded Raw. If not recorded Raw, this option will be greyed out.

DVDs only have **one** type of blocks and they contain only user data ([there's no such thing as special mode blocks for Video Data](#)). So in case of DVD, this option will be greyed out.

Extract Raw

This method will extract all blocks [Raw](#). In case of files and folders this choice is not a good idea. The resulting files will contain a lot more than the actual file data and will appear to be corrupt. This option is solely provided for engineering purposes.

In case Image files are extracted, Raw becomes a lot more appealing and is actually the preferred method in many cases.

If you use this method in an [Image File](#), the image file will need to be recorded Raw. If not recorded Raw, this option will be greyed out.

DVDs only have **one** type of blocks and they contain only user data (there's no such thing as Raw DVD data). So in case of DVD, this option will be greyed out.

Run

Will only work if you select one single file. That file will be extracted to the system's temporary folder (e.g. C:\Windows\Temp) and will be run from there. This also means that if you run an executable (e.g. Setup.exe) which requires or loads additional files on the CD or Image File (e.g. dlls) they will have to be extracted to the same folder as well.

Extract and Run

Extract and Run is actually the same as Run expect that you are able to choose the location first.

Extraction of ALL files and folders (directories)

Possibly IsoBuster found multiple [File-Systems](#) and most likely they all point to the exact same files and folders.

[Read the part about the different File Systems to make your choice.](#)

(In short, the icons directly connected to the track icons are File Systems. Preferably choose the [Joliet](#) or [UDF](#) File System)

If you want to extract all files and folders of a CD or out of an image file, you best start from the File-System of your choice.

Right mouse click and Extract.

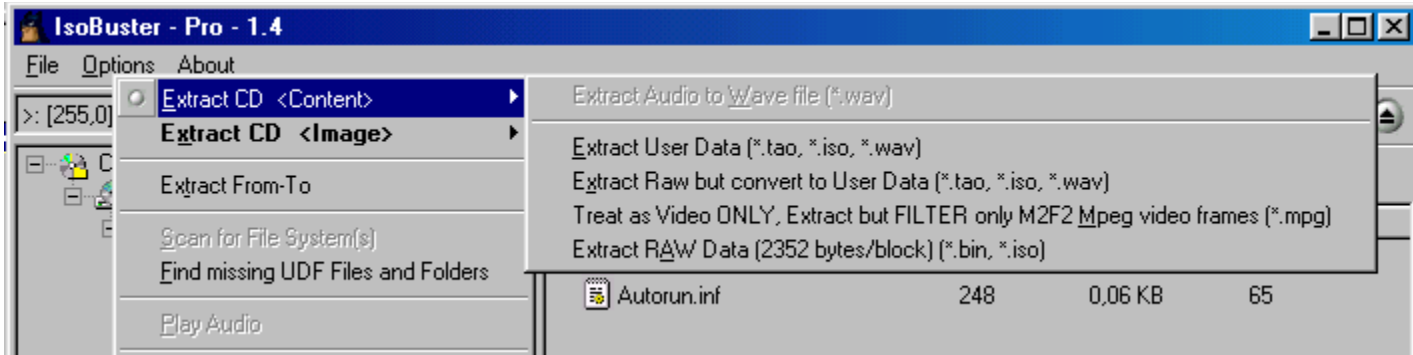
Extract (in bold) is the best choice !

Extraction of selected files and/or folders (directories)

Select the file(s) and/or folder(s) you want to extract and choose Extract (Extract option in bold).

To select more than one object at a time, select them in the right-hand-side ListView.

In the left-hand-side TreeView you can only select one object at a time.



Extraction of a Track

The only real good reason to extract a track is to extract an audio [track](#) to a wave (*.wav) file.

This extraction method extracts the user data portion from every block **but** for audio this is actually exactly the same as extracting Raw.

A wave file is a raw audio track with a small header in the beginning of the file.

If you select 'Extract Raw' you end up with the same file but without the small header in the beginning of the file.

For data tracks the story is different and except for engineering purposes there's not much use for extracted data tracks to an image file.

Extract the user data portion will extract exactly that to a *.tao file. In most cases a *.tao file will then contain 2048 bytes per block.

Extract Raw will extract to a *.bin file and all blocks will contain 2352 bytes.

Extract but filter [M2F2](#) Mpg blocks will scan a track and will filter all Video blocks (e.g. on [VCD](#), [SVCD](#) and [CD-i](#)). This option is great when the File System of a [VCD](#), [SVCD](#) and [CD-i](#) is corrupt but you want to recover the video data from the tracks.

Extraction of a Session

Extracting a session can be done two ways : Extraction of the **Content** <Content> or Extraction to an **Image** File <Image> .

Similar to extracting a Track there are only a few good reasons to extract a session and if you're not an expert I wouldn't bother.

<Content>

This will extract all the Tracks in this session one by one, using the Extraction method of your choice.

Read previous topic '[Extraction of a Track](#)' to see what that means per track.

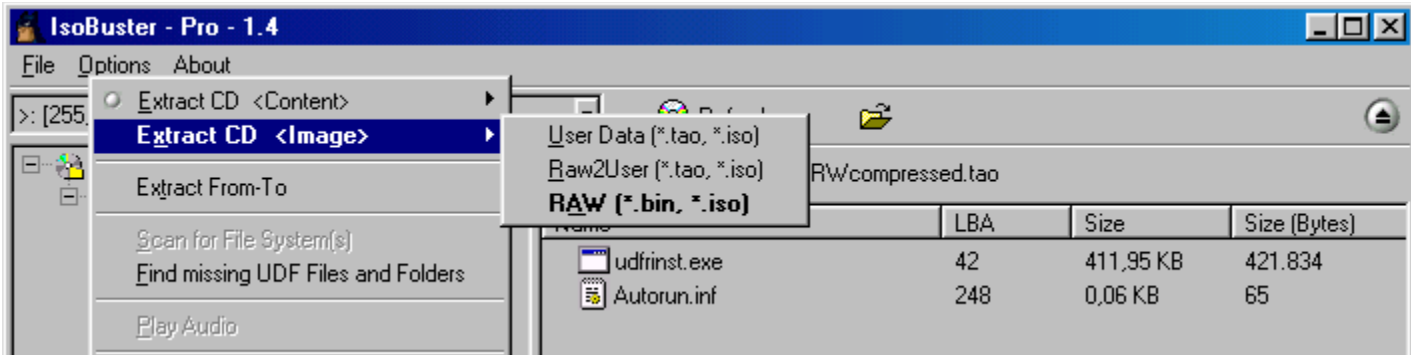
The only good reason to choose this if you want to extract all audio tracks of a session to wave (*.wav) files.

<Image>

This will extract a Session to an Image File. However, only in case of engineering skills this is really a good idea.

The resulting Image File will contain the blocks starting from the first block of the first track of this session and ending with the last block of the last track of this session.

To make an Extraction choice, look into the next topic '[Extraction of a CD or DVD](#)'



Extraction of a CD or DVD

<Content> (All Sessions and tracks are extracted separately, one by one)

This is similar to <Content> extraction of a session.

This will extract all the Tracks on the CD or DVD or from the Image File one by one, using the Extraction method of your choice.

Read previous topic '[Extraction of a Track](#)' to see what that means per track.

The only good reason to choose this if you want to extract all audio tracks of a session to wave (*.wav) files.

<Image> (THE Image File creation tool)

This is **THE** option if you want to create a **Image File** of your CD, DVD or if you want to convert the Image File to another format.

This extraction method will extract all blocks, starting from the very first to the very last block, of your CD, DVD or Image File.

In case you're dealing with a normal data CD (e.g. a Windows installation disc) extracting the user data alone is probably a good idea.

However, when you suspect there are other modes on the CD as well (e.g. Audio, M2F2 (e.g. [VCD](#), [SVCD](#) and [CD-i](#)), ...) you better extract **Raw**. So in a sense extracting an Image File raw is probably always the best idea !

ISO Image Files are extremely popular but they come in many different formats and some write applications take them all but some are very picky in their choice.

If you extract an image raw you will create image files that are compatible with the majority of write applications !

The resulting *.bin file can simply be renamed to an *.iso file. **Yes, *.bin files and *.iso files are often exactly the same !!**

Only (to my knowledge) Roxio creator does not like raw *.iso files. In that case you better extract the image file to user data only and rename the resulting *.tao file to an *.iso file.

Converting Image Files to *.iso is exactly the same. Extract Raw to *.bin (=*.iso) and all the Image File overhead stripped to the Raw essence. Extract user data only if you want to convert for Roxio Creator and rename to *.iso.

If the Extract Raw option is greyed out this means that the source (DVD or Image File) does not allow to extract raw. The reasons are simple. DVD only knows 2K blocks (2048 bytes user data) per block without any overhead. There no such thing as Audio or Video mode blocks on DVD. Image Files may be recorded with '[user data](#) only' and so logically they can not be extracted [raw](#) as they only contain the user data.

Extract From - To

Extract From - To is a engineering tool and allows to extract blocks of your choice. It's a powerful feature if you're in the engineering business. If you just want to extract data (Image Files or files and folders) then this is not of much use to you.

The Extraction options are thoroughly explained in 'Extraction of a CD or DVD' <Image> section.

Errors : See ['Errors during Extraction'](#)

Errors during extraction

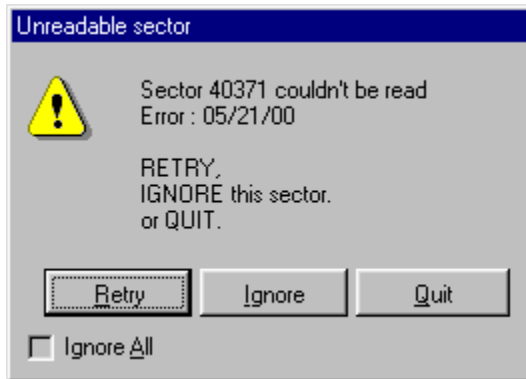
During extraction of data from an image file, a CD or a DVD one can get errors. It's not what you want ... but it can happen.

In case of an image file the reason is mostly that the data seems so garbled that no sensible data can be derived anymore, or when the end of the file is reached.

In case of CD or DVD it's the CD/DVD-ROM device which returned an error.

In that case NO data was returned.

If an errors occurs, IsoBuster offers several options, depending on the way how the extraction is done.



This Error Message can occur when you're extracting files and folders. It offers you the choice to RETRY reading the sector, IGNORE the sector (no substituting data will be written for the missing sector) or to QUIT extracting altogether.

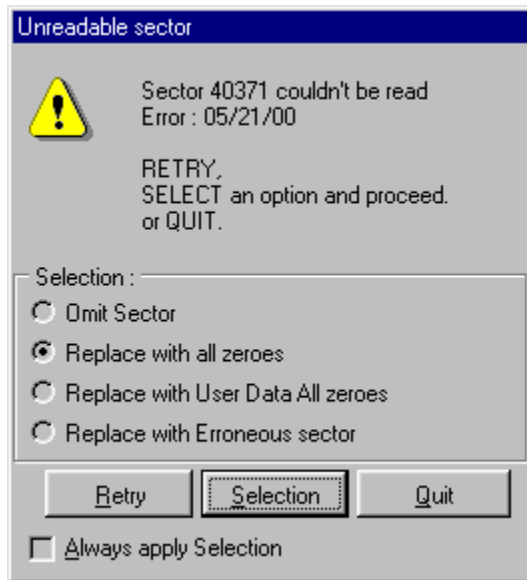
The option 'Ignore All' will make sure you're not prompted again during extraction and all erroneous sectors will be omitted. Depending on the situation you may need to renew the 'Ignore All' request when multiple objects are selected for extraction.



This Error Message can occur when you're extracting data (from CD, DVD or image file) to an image file, but only the user data portion. It offers you to RETRY reading the sector, apply an option from the SELECTION window or to QUIT.

The possible selections are :

OMMIT data which means no substituting data will be written for the erroneous sector (this is the least likely option you would need),
REPLACE with all zeroes which means the sector size will be written but containing zeroes only,
REPLACE with dummy data which means the sector size will be written with data different from zeroes.
The selection making most sense will be selected by default.
Click the check box 'Always apply selection' when you do not want to be prompted again during extraction. Depending on the situation you may need to renew this request when multiple objects are selected for extraction.



This Error Message can occur when you're extracting data (from CD, DVD or image file) to an image file, raw. It offers you to RETRY reading the sector, apply an option from the SELECTION window or to QUIT. The possible selections are :
OMMIT data which means no substituting data will be written for the erroneous sector (this is the least likely option you would need),
REPLACE with all zeroes which means the sector size will be written but containing zeroes only,
REPLACE with user data all zeroes means that the replaced raw block will contain raw data completely according to the CD standard (sync bytes, header, sub headers, EDC/ECC etc.) but with User data containing all zeroes.
REPLACE with erroneous sector means that the replaced raw block will NOT contain raw data according to the CD standard so that a copy tool will recreate the errors (e.g. some programs require errors on the CD). The selection making most sense will be selected by default.
Click the check box 'Always apply selection' when you do not want to be prompted again during extraction. Depending on the situation you may need to renew this request when multiple objects are selected for extraction.

Data recovery

IsoBuster is a powerful data recovery tool.

Support for all the different CD and DVD readers out there, support of Image Files and support of all the different CD/DVD File-Systems.

Basically, when you select a drive and the drive contains the CD / DVD in question from which you want to recover data, IsoBuster will immediately quick scan the content and offer you extraction methods.

How to start :

- 1) Insert the CD / DVD in your CD / DVD -ROM drive. [If you have a CD / DVD writer I suggest you try it in that device.](#)
- 2) Wait until the content is scanned and IsoBuster shows you the [Session, Tracks and File Systems it found.](#)
- 3) In case you see the files and folders you were looking for : [Select what you want and Extract. E.g. start from the File System of your choice.](#)
- 4) In case you don't see the missing files (e.g. you only see one or more sessions with one or more tracks) you better try the full surface scanning function "[Find missing UDF files and folders](#)".

Some advice :

In case the CD / DVD is damaged or recorded very poorly you might run into the problem that some readers can get to more data than others.

Here you get into the grey zone where some devices are still able to read data but others aren't

In case of big problems, try a number of CD / DVD drives, go to your friends or neighbours and ask if you can try it in their CD / DVD ROM drive.

Often you have more success if you try CD/DVD-RW recorders instead of CD/DVD-ROM drives.

The moment some [sectors](#) are very hard to read some drives may time out very quickly but others may take forever. That and the fact that IsoBuster retries in different ways to force the unit to spin down or to get to the data in an alternative way, may result in what **seems** to be a hang situation. In fact IsoBuster is waiting for the device to respond and that up to 30 seconds per command. So for 30 seconds IsoBuster seems non responsive and because the command is retried immediately it may actually appear to be a lot longer. If you're dealing with such a situation you might want to start up IsoBuster data extraction during the night and check the result in the morning.

[Also consider reading with a lesser retry count.](#)

Data Recovery from Blanked CD-RWs :

This is a completely different problem.

In case the CD-RW was blanked completely there's no way to get to the data anymore. The data has been over-written and is gone.

In case a minimal or quick blank was chosen there is still a chance. However all the critical data in the [TOC](#) and so on has been overwritten. The CD-RW Reader is under the impression that the media is empty and will **not** allow to read in the data area.

The only way to get to that data is by means of special hardware and tools. Smart Projects offers this service but you will need to send the CD-RW to the lab. Contact BlankedRWRecovery@Smart-Projects.net for quotes and instructions. There are also no guarantees as some writers destroy more than others during minimal blank. You should also only consider this service for data CD-RWs, not for audio !

Data Recovery from Blanked DVD+RWs :

This situation is not comparable to a blanked CD-RW and much depends :

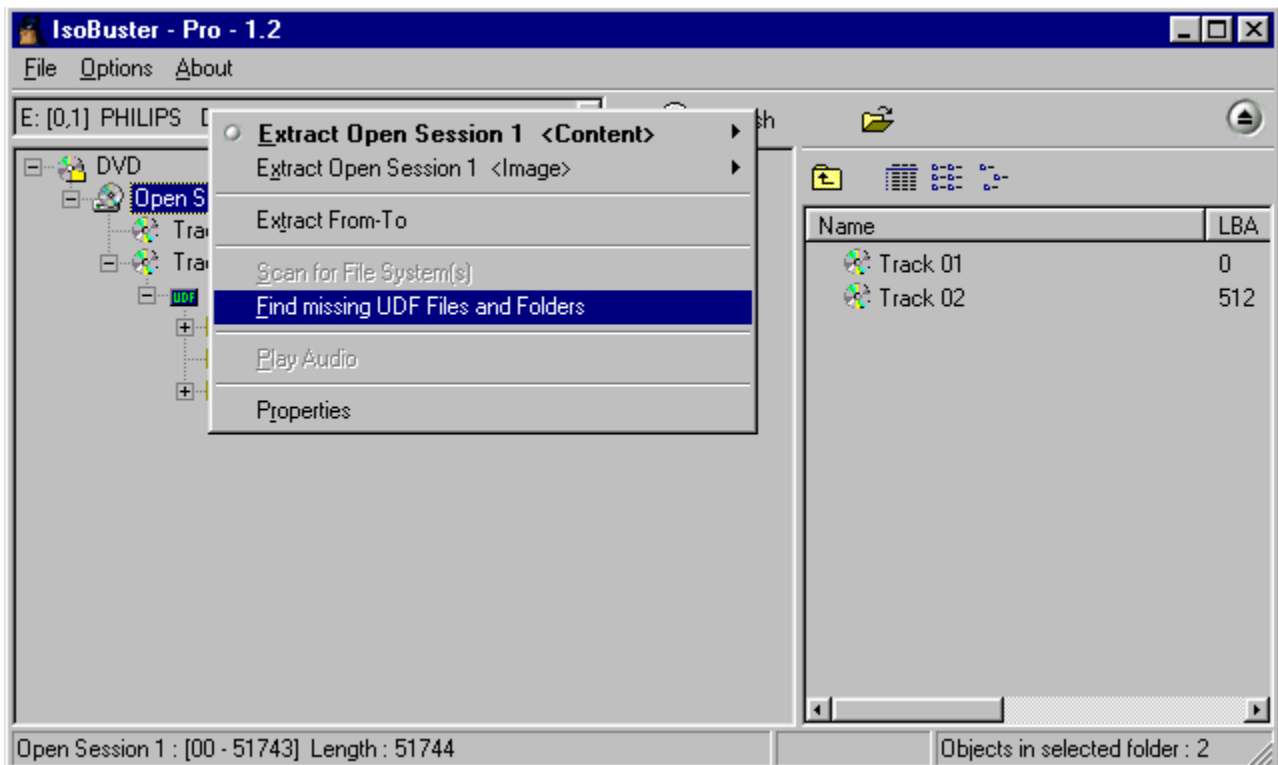
- on the time it took to blank,
- on the type of DVD+RW writer,
- on the application

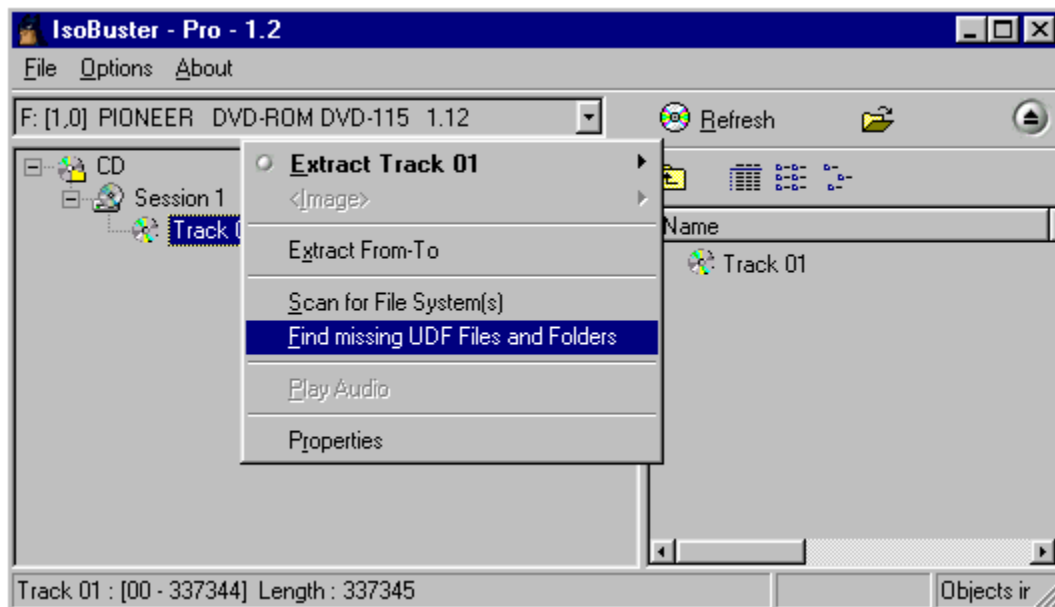
Bottomline : you stand a good chance of being able to recover data with IsoBuster. Just run IsoBuster free and look for the files. If they're there, register IsoBuster and extract them. If the free version can't find the files, the registered version won't either.

Find Missing UDF Files and Folders

Suppose you created a CD or DVD with drag and drop software (e.g. Direct CD, InCD, VOB Instant write, BHA B's gold, Packet CD, DLA, ...) and you come to the conclusion that suddenly part if not all data is gone. Or you just deleted a file and suddenly realise you want the file back. In any of these cases this function of IsoBuster might be a **life-saver** !

What you do is, you select the Session where you lost the data (typically that is the last session or even only session (e.g. on RW media)), and you select "Find missing UDF files and folders". This means, position the cursor on the **session** icon and right click. See screen shots for examples :
(If you start from a track icon, IsoBuster will still scan the full session, if you start from a CD/DVD icon, IsoBuster will only scan the last session)

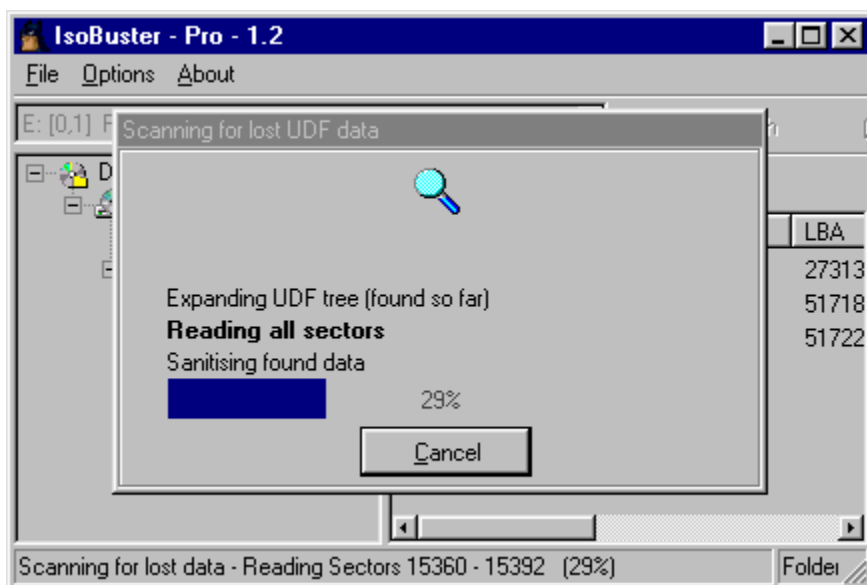




Before you start scanning the disc you might want to consider to [change the Read Retry count](#). Do this based on your experience with the CD-ROM/DVD-ROM reader you're using. E.g. if scanning takes a loooooong time you could abort and restart with a much lower retry count.

The moment you select "Find missing UDF files and folders" IsoBuster will read all [sectors](#) in the session. During this full surface scan IsoBuster will try to find all old files and folders which are not connected anymore to the normal [UDF file system](#) (if at all a file system could still be found). The recovery action exists in three steps.

- First the file system which could be found via the normal way is fully expanded.
- Next the entire surface is read and all **relevant** data is stored in memory.
- Finally all that data is processed and in worst cases still some CD/DVD access is required during that action.



When the recovery process has ended, and with a bit of luck, IsoBuster will have found lost and/or deleted files and directories.

Files and directories linked in the 'Lost And Found' root will have no name because the name was unretrievable, these files and directories are orphans. Files and sub-directories in these 'unnamed', 'lost' or 'orphaned' directories will have their original name again.

IsoBuster has a unique feature that scans all the orphaned files' content and tries to determine what the file extension is. E.g. this way, and with a bit of luck, you will be able to distinguish .bmp, .gif, .jpg, .wav, and many other file types.

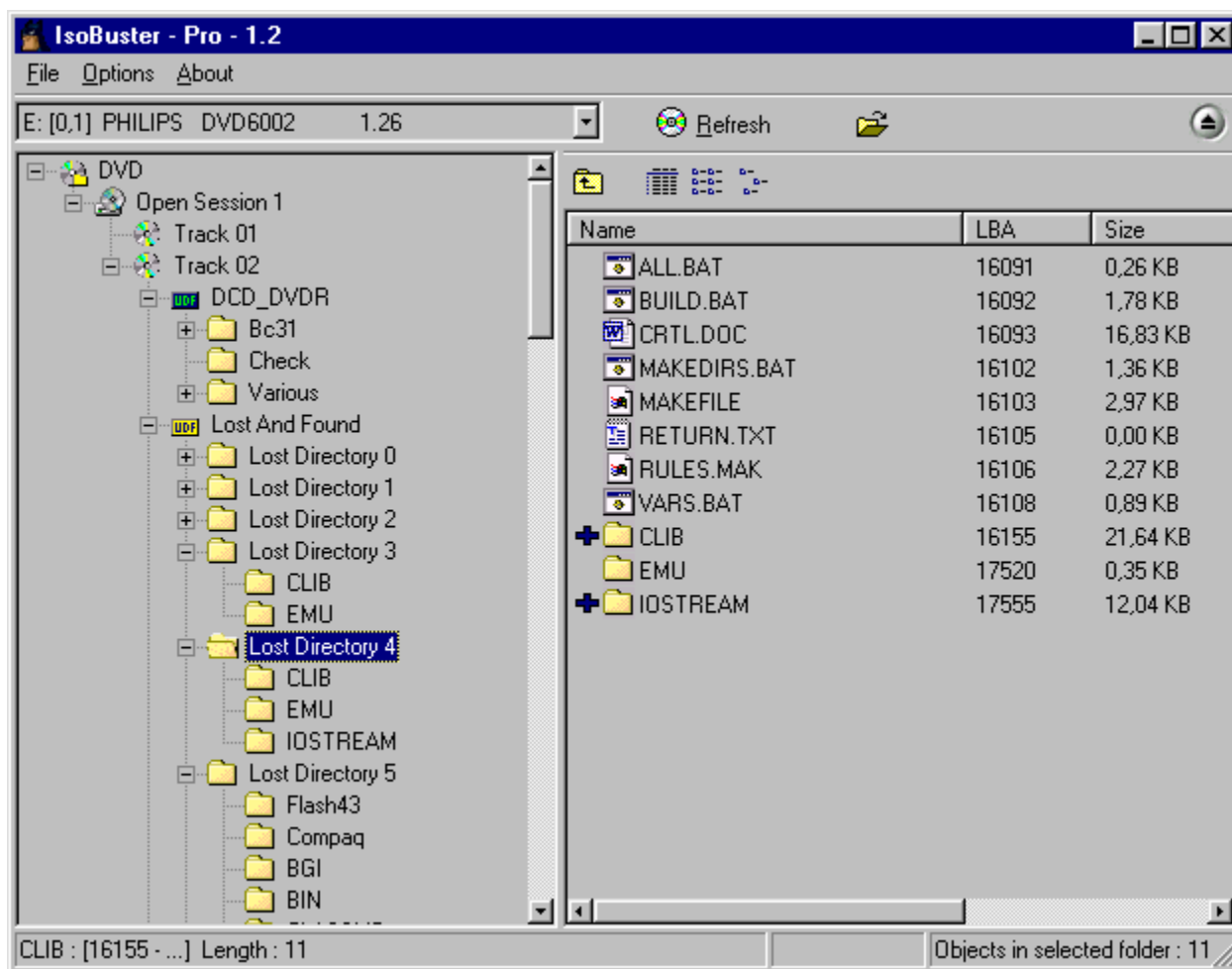
[This feature can be turned off.](#)

The [yellow](#) 'Lost And Found' root directory will be linked to a [track](#) icon in the selected session (left pane). You can change a name (e.g. 'Lost Directory 01' to 'My Pictures') by selecting that object (file or folder, e.g. 'Lost Directory 01') in the list view (the pane on the right) and by clicking once on that object or by hitting F2. (try it and you'll see).

To recover these found files and/or directories, just [extract as you would normally extract a file or directory with IsoBuster.](#)

Right click and choose Extract (the first or top option of the popup window).

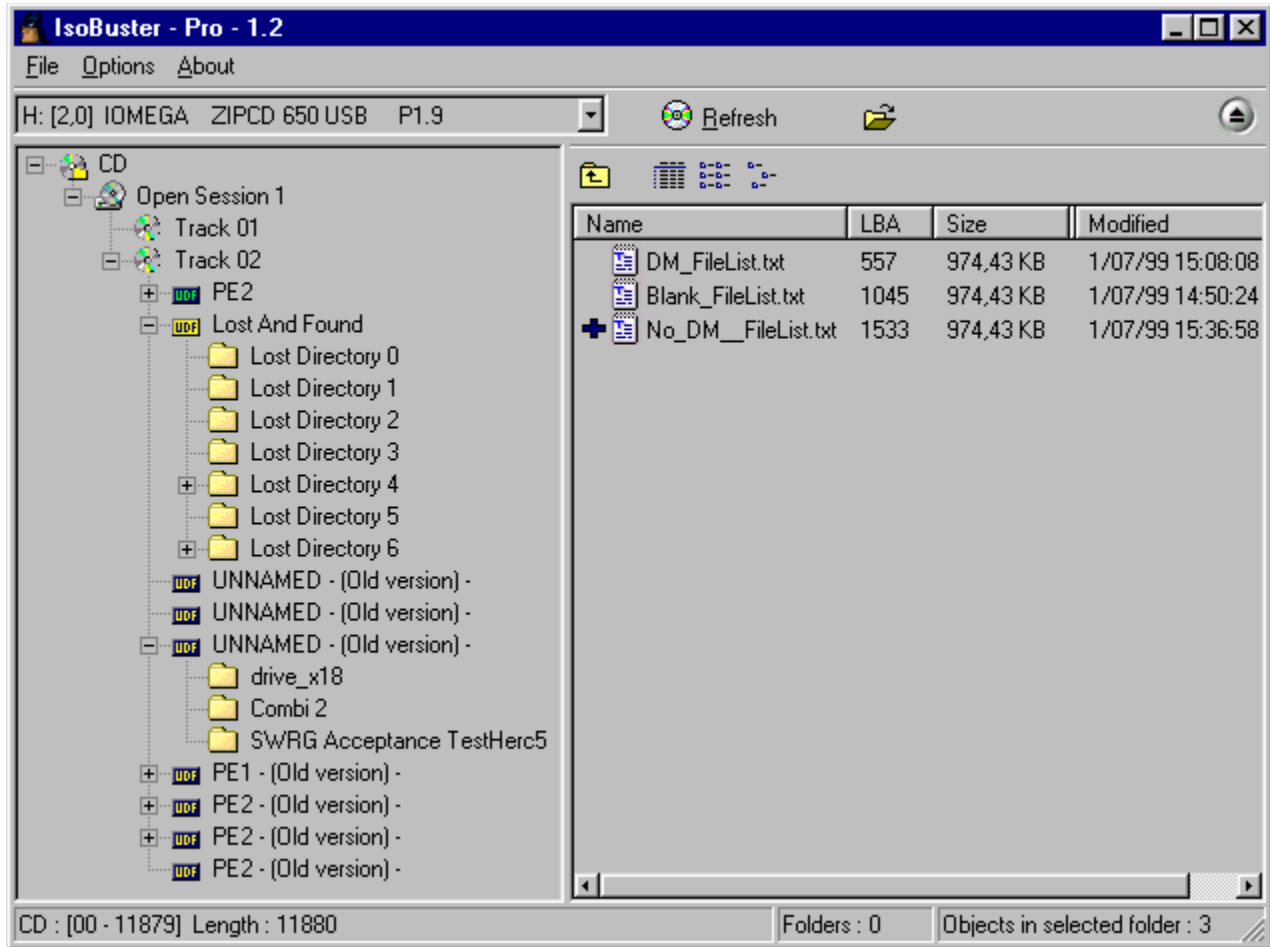
The screen shot shows found files and directories.



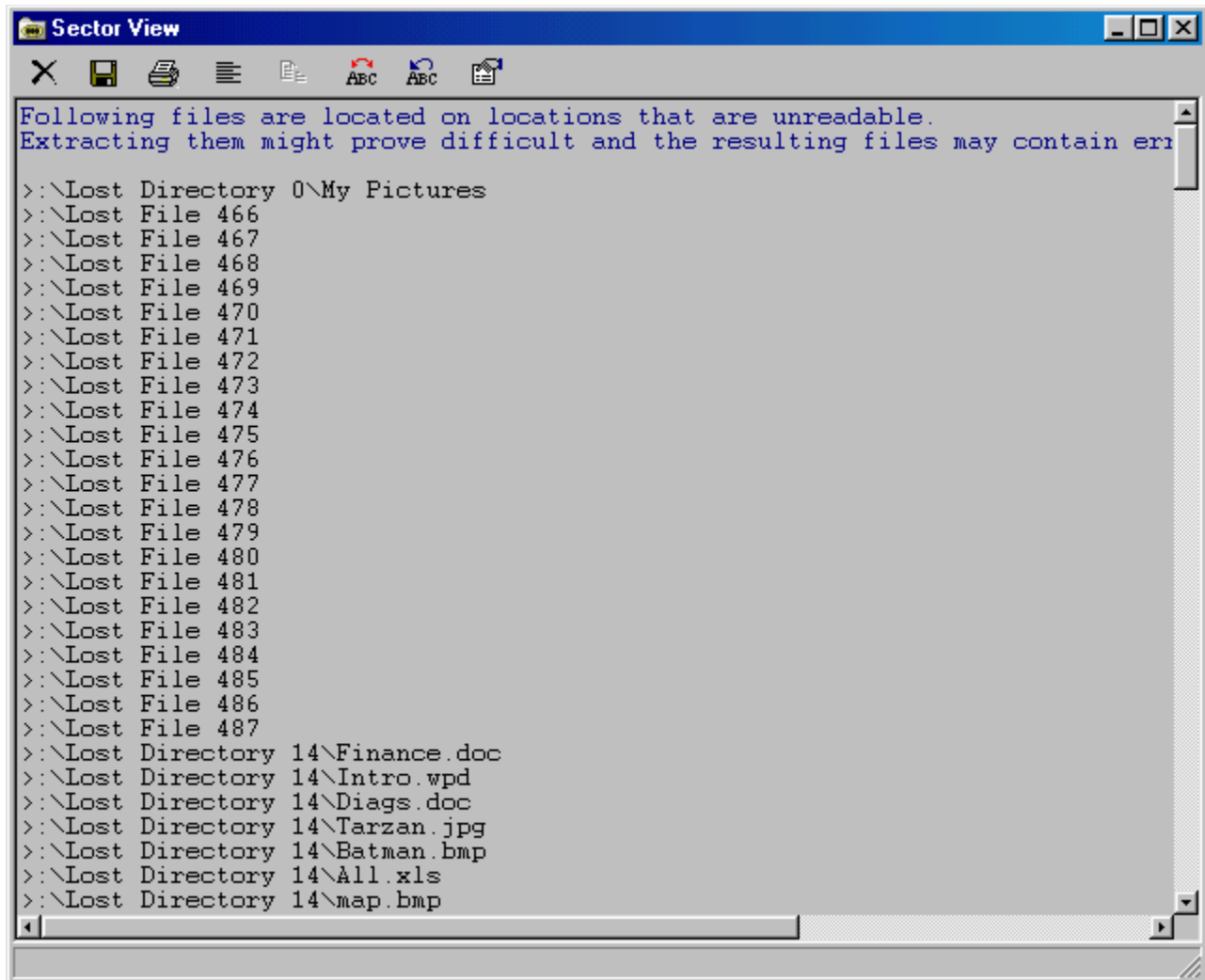
In case you did above explained recovery action on sequentially written media (e.g. what Drag and Drop applications do on CD-R, DVD+R and DVD-R (some apps also allow to do this on Rewritable media)), you will notice that IsoBuster also found all previous [UDF file-systems](#). The previous file systems show an old version of the files and folders. This means that you can get back an old layout of files and


directories, or this way you can get back to an old version of a document you have edited a few times already. This option offers lots of possibilities

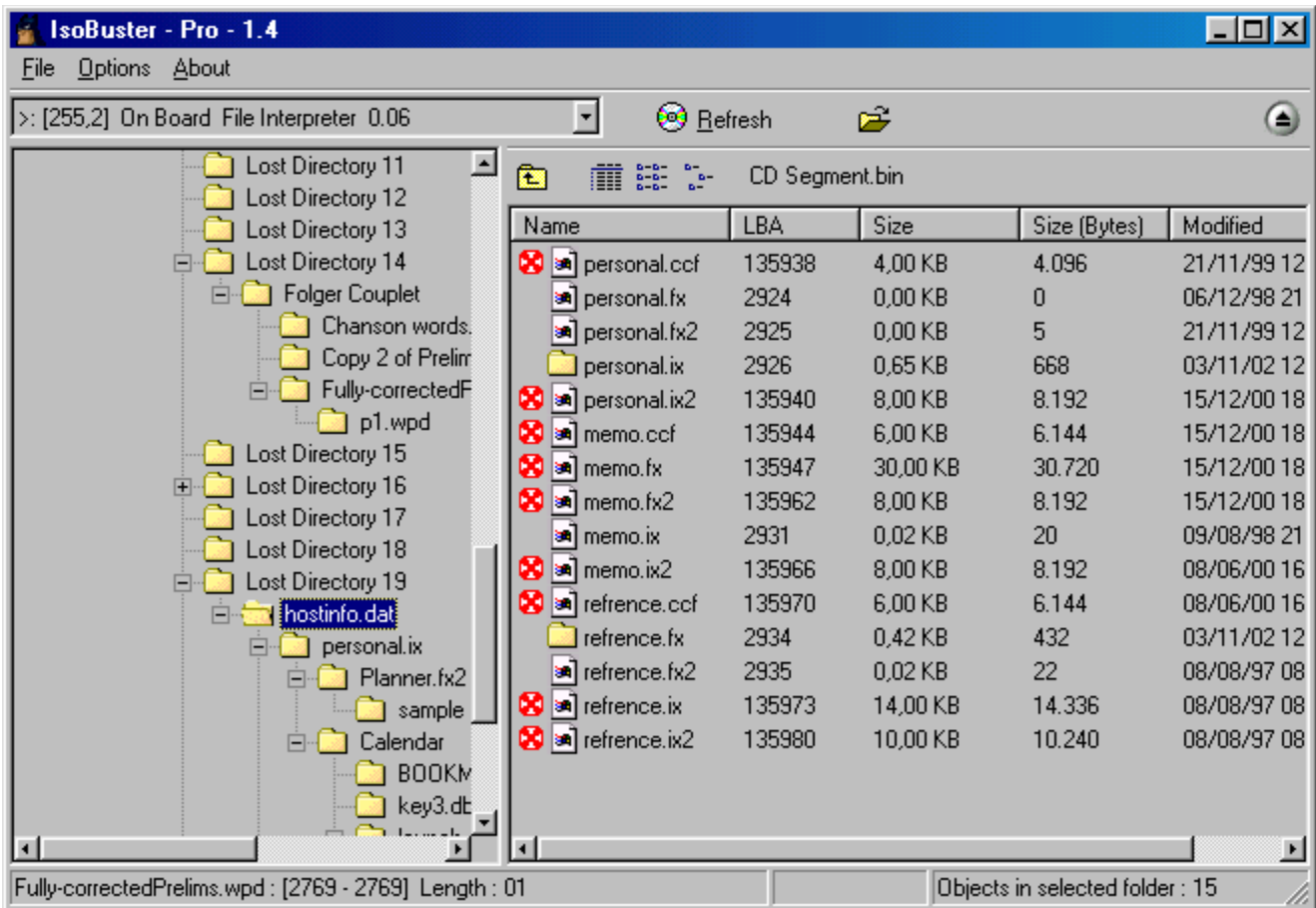
In case such older UDF file systems are found, they are attached with a [blue UDF icon](#) to one of the track icons of the selected session. They are also marked with ' - (Old Version) - '.



If IsoBuster detects errors during the scan, those sectors are marked. After the scan and if files are affected by errors (e.g. the files are located in erroneous sectors) IsoBuster generates a list of all files that are affected. You can edit, save, print, ... this list.



IsoBuster will also use the scan information to add an 'error' icon  next to every file which is affected and which is likely to be corrupt if you try and extract the file.



Extract From - To

Starting from a Track, Session or CD / DVD icon you can Extract From - To

A Window will pop up with the start address of the object you selected and a length of the object you selected.

However, you are free to manipulate the address and length as you like and so a powerful engineering tool is available.

Any sector at any location can be read (as long as the device allows it) and you can use multiple extraction methods for this task.

To understand the Extraction Methods, please read : [Extraction Options](#).

Extract From-To [X]

Start Address (LBA)	<input type="text" value="215791"/>	MSF : 47:59:16
<input type="radio"/> End Address (LBA)	<input type="text" value="330847"/>	MSF : 73:33:22
<input checked="" type="radio"/> Length (LBA)	<input type="text" value="115057"/>	MSF : 25:34:07

Extraction Type

- User Data (2048 bytes/block for MOST sectors) (Use on standard Data CDs ONLY)
- User Data but FILTER only M2F2 Mpeg frames (2324 bytes/block) (Use on VCD & CD-i)
- Raw data (2352 bytes/block) (can be used on ALL CDs (Audio, Data, VCD, CD-i, ...))

File Systems

Data CD and DVD discs contain one or more File Systems.

The File System describes where and how on the media the files and folders are located.

A File System is often confused with a [TOC](#) but it is not.

The [TOC](#) describes the session and track layout of a CD or DVD it does **not** describe the files and folders.

[To understand the TOC better, read the section about the CD/DVD Layout.](#)

In most cases the different File Systems point to the same files and the reason for the different File Systems exists to support as many different Operating Systems as possible. In some cases however, File Systems **DO** differ and one File System may for instance contain a driver to be able to read the other File System.

IsoBuster scans for all File Systems it knows and will show them all !

This allows for the user to select the File System he/she requires.

This also provides alternative ways in case one File-System is corrupt but the other one isn't !

This is a very powerful feature of IsoBuster in it's quest to be able to recover 'all' data !

You will recognise a File System as the icon connected to a Track icon in the 'Session and Track layout' of the CD/DVD.

IsoBuster fully supports :

- **ISO9660**



The most common File System on all CDs and DVDs is the ISO9660 File System.

It is however also the oldest and has some major disadvantages such as short file names (8.3) and a directory structure which can only be 8 levels deep. Because of these limitations it is almost always accompanied by one or more File Systems that don't have these limitations. However you need it if you want to see the content of the CD in an old DOS mode or an older Mac or Sun system.

Some mastering application sin against these limitations and allow to master ISO9660 with long file names and more directories deep. This shouldn't be a problem as of Windows 95 OSR2 but these CDs might cause problems in other systems.

Of course IsoBuster has no problems with these CDs as well.

Sometimes this File System mentions for what system the CD was mastered. IsoBuster shows this with following Icons :



SUN



MAC

ISO9660 is recorded in a number of duplicate structures (with different byte order)

[You should also read the section Options \ File System settings](#) as you are able to influence how ISO is interpreted based on these duplicate structures.

- **Joliet**



Joliet is in fact an extension of ISO9660 and in many ways exactly the same.

Some File System Volume Descriptors are different which allows OS to recognise this File System and prefer it if available.

Joliet allows long file names and a directory structure which is substantially deeper.

It will be used automatically (preferred above ISO9660) by Windows 95 or higher.

- **Rock Ridge**



Rock Ridge is also an extension of ISO9660 but never really became the standard (Joliet did). It was very popular on Commodore CDs and also was a way to allow for longer file names and more directories deep.

It is not supported by Windows and Windows will use the ISO9660 File System on such CDs

- **Who knows ?**



This File System starts with its own Volume Descriptor which has all the characteristics of Joliet but points to all the tables of the ISO9660 File System.

It is probably supported by Windows as I have only seen it on official Windows installation CDs. It is always accompanied by Joliet as well and Joliet is preferred above this File-System.

- **CD-i File System**



Another File System derived from ISO9660 standard but with some specific differences which prevent an ISO9660 interpreting system to always correctly deal with this File-System. It **only** appears on CD-i discs and these discs (besides this unique File System) also have some other 'features' which cause real problems on normal systems.

CD-i is not supported by Windows 95 or higher.

- **EI Torito - Bootable CD/DVD**



This is not really a File System, more an extra feature of the ISO9660 File System.

CDs and DVDs can be made bootable but then the ISO9660 File System needs to be present alongside with the EI Torito Volume Descriptor and a Virtual Floppy image.

By just copying a Virtual Floppy image to a CD/DVD one does not make the CD/DVD bootable ! The File System needs to be setup as well.

[More about this here.](#)

Bootable CDs and DVDs (or the EI Torito standard if you will) needs to be supported by the BIOS of your PC system, not the Operating System. Older BIOS do not handle Bootable CDs well let alone bootable DVDs.

- **UDF**



UDF is the 'new' CD/DVD File System and it is already used in a number of situations. There also have already been some major changes, so can you encounter UDF 1.02, UDF 1.5 and UDF 2.01


- DVD-ROM discs should always contain a UDF File-System, preferably UDF 1.02
- Packet Written Discs (CD-R and CD-RW), e.g. by Roxio Direct CD or Nero InCD use UDF 1.5
- UDF 1.5 contains mechanisms to be able to append files and to be able to deal with defects on host side.
- Mount Rainier discs should contain UDF 1.02 again because the drive takes care of defect management.


UDF 1.02 is supported by Windows 98 or higher if the media is closed and contains a TOC. It is preferred over Joliet and ISO9660 if found.


What's the difference between : ,

 and

 :

 : This is the UDF file system which was found via the normal way, the way it is intended to find and explore a UDF file system, possible the same file system as found by other applications.

 : This is a recovered UDF file system. It is assembled by putting all lost but found files and directories together. Where possible the tree structure is respected, but the files and directories in the root can come from everywhere. You can find this FS by using the function "[Find missing UDF files and folders](#)".

 : This is an old file system. This once would have been a green (normal icon) but afterwards files were added, altered or removed or the application just decided to write a new file system. A sequentially written media can contain lots of these and it allows you to go back in time looking at older documents and so on. You can find these by using the function "[Find missing UDF files and folders](#)".

[You may also want to read the section about : Write Applications and File Systems](#)

CD/DVD Layout

A [CD](#) or [DVD](#) contains pits and lands in a groove.

And when a laser reads over these pits and lands (while following the groove) a high frequent signal is created.

From this high frequent signal logical 0 (zeroes) and 1 (ones) can be derived (through Analog to Digital circuitry).

Pits and lands are terms used to **originally** indicate a height difference (e.g. a pit is low and land is high) however pits and lands can also mean a reflectivity difference (e.g. RW), so the height is the same but the reflectivity is different and so again logical 0 (zeroes) and 1 (ones) can be derived from the resulting high frequent signal.

The resulting binary data (zeroes and ones) is then mangled through several decoding mechanisms, each time cutting off the error correction and household data (Level 1 and 2 error correction in case of CD).

The data is also de-interleaved and put together in addressable physical blocks in different areas. Areas like the lead-in, the program area, the lead-out etc.

While physical addresses are being used internally by the optical device (CD/DVD-ROM drive) a [host](#) (OS, application, ...) will be able to address [logical blocks](#). Logical blocks can but do not necessarily match with the physical blocks. There are several addressing methods (methods 1, 2 and 3) and they allow a drive to 'hide' physical sectors which a [host](#) doesn't need to see. E.g. run-in, link and run-out blocks in case of packet writing, spare areas in case of Mount Rainier etc. ...

Every block which is made up of 2352 bytes can contain data in different [modes](#).

E.g. an [Audio block](#) contains 2352 bytes of audio data.

A [Mode 1 Data block](#) contains 2048 bytes of user data. The remainder of the 2352 bytes was used to do [third layer error correction](#) and so on.

A continuous un-interrupted, in ascending order addressable, set of logical blocks of which the start address is recorded in the [TOC](#) (or DVD structures) is called a track.

A CD or DVD contains one or more tracks.

And a track is always located in a session.

So in fact the most simple CD or DVD layout is a disc containing one session with one track.

Tracks are made up from blocks which were mastered or recorded in different modes but basically you can distinguish two different kinds of tracks.

[Audio tracks and Data tracks.](#)

Audio tracks are **always** mastered or recorded in one mode : Audio.

Data tracks can be recorded in the 2 modes 1 or 2 and in case of 2, different Forms are possible as well.

A session can contain one or more tracks.

When a session is finalised, a [TOC](#) (or DVD structure) is recorded in the lead-in of that particular session. So every session has it's own TOC containing the layout of the session **and** the layout of the previous sessions.

A CD/DVD-ROM drive will always look for the highest session and will find the layout in the lead-in of the last session.

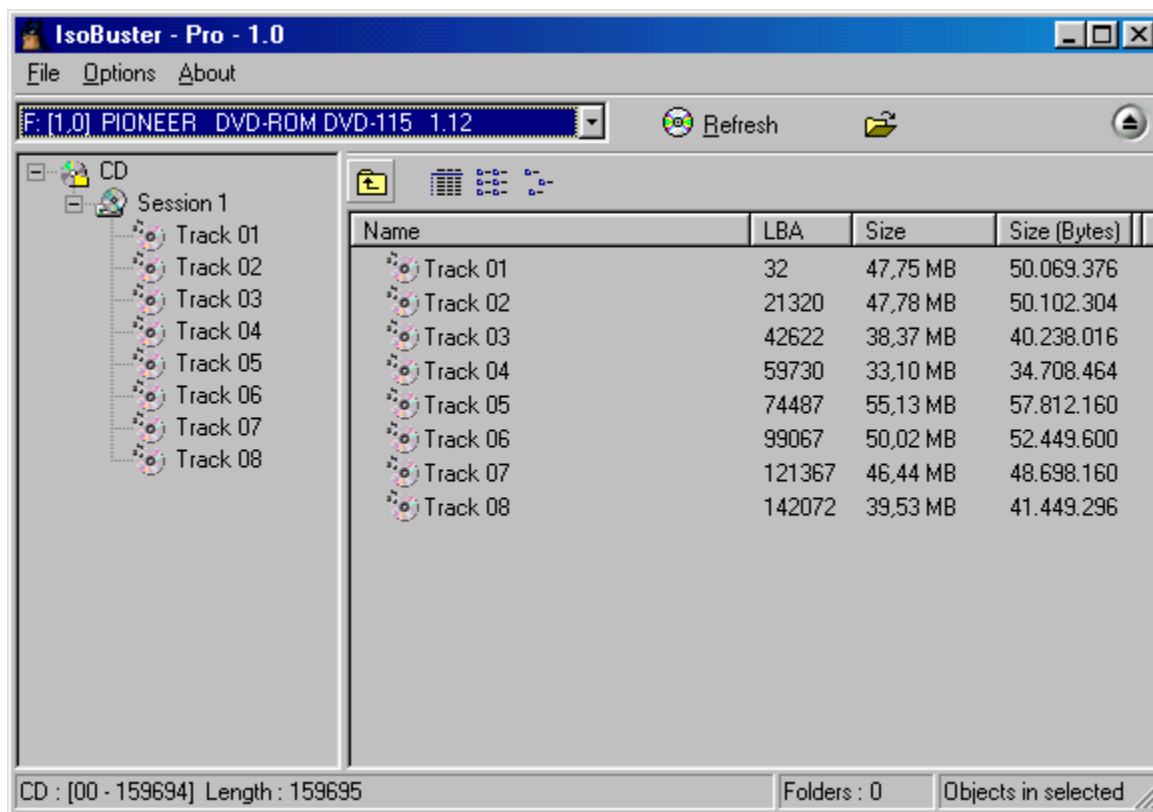
Audio copy protections often rely on the fact that standard audio players only look in the first lead-in to find the audio tracks in the first session. A CD/DVD-ROM drive however looks in the highest session lead-in and that's where sometimes incorrect data is stored about the first audio tracks so that they become inaccessible.

A first session's lead-in is not addressable. Lead-in and Lead-outs of the higher sessions are located in the program area and are addressable but mostly not accessible by the host.

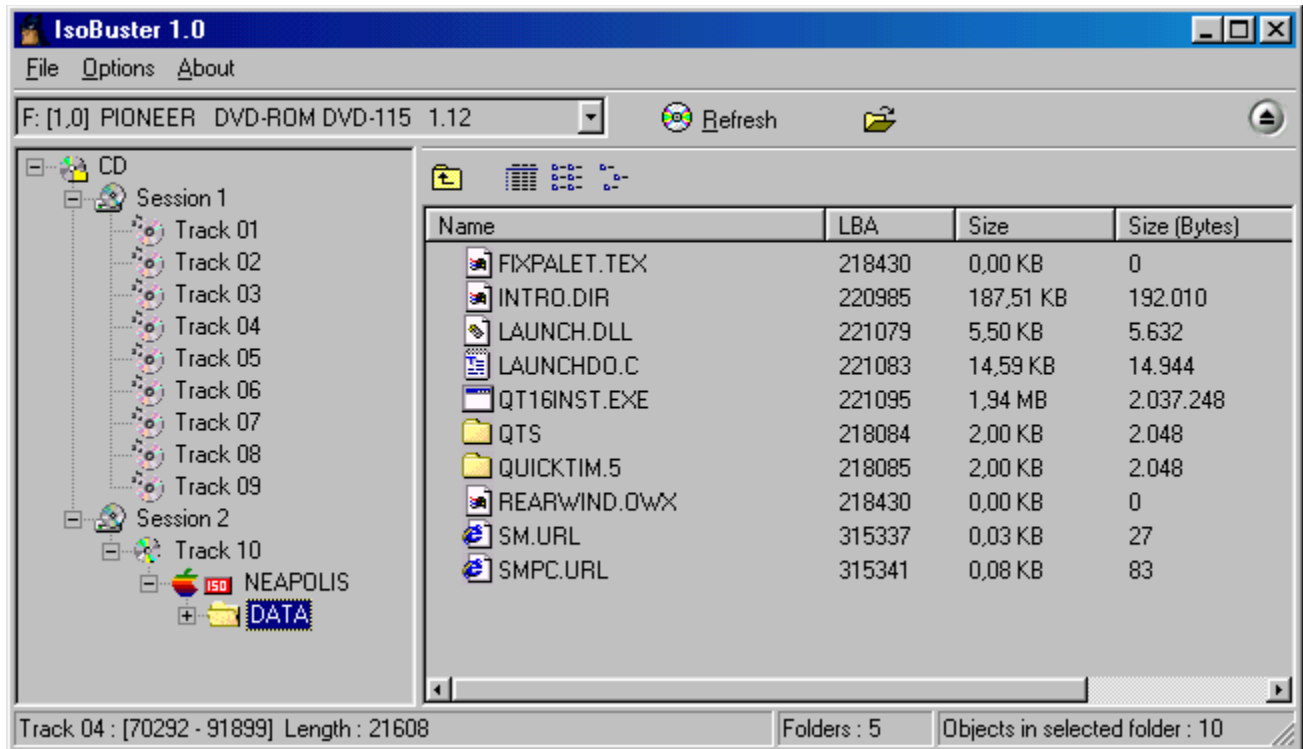
Then finally, now Blocks, Tracks and Sessions are understood ...

a higher level order is the combination of tracks and sessions.

An **Audio CD** contains a set of audio tracks in the first session. The Audio CD standard (Red book) describes audio in the first session only.



A **CD-Extra** or **Enhanced CD** contains a combination of audio tracks and data tracks so that standard audio players can play the audio tracks (as they only bother about the first session). CD/DVD-ROM players report **all** the tracks, including the data track(s) in the second session and that's where an operating system will look for File-Systems.



Another variant used to combine Audio with Data is the so called **Mixed Mode CDs**. They contain both audio and data tracks in the first session. The first track is a data track (where the Operating system will look for File System) the remaining tracks are audio tracks. A standard audio player of today will skip the first data track and proceed with the audio tracks, older audio players could get into problems trying to play the data tracks (Hence the use of Enhanced CD).

Multi-Session Data CD/DVD

Recording data CDs has become an every day thing and many people own a CD and/or DVD writer. Since the media can often contain more data than it is used for while recording the option was created to add more sessions.

Every session contains its own File-Systems pointing to the different files and folders. The strategy of the File-Systems on Multi-Session CDs is explained in [File Systems](#).

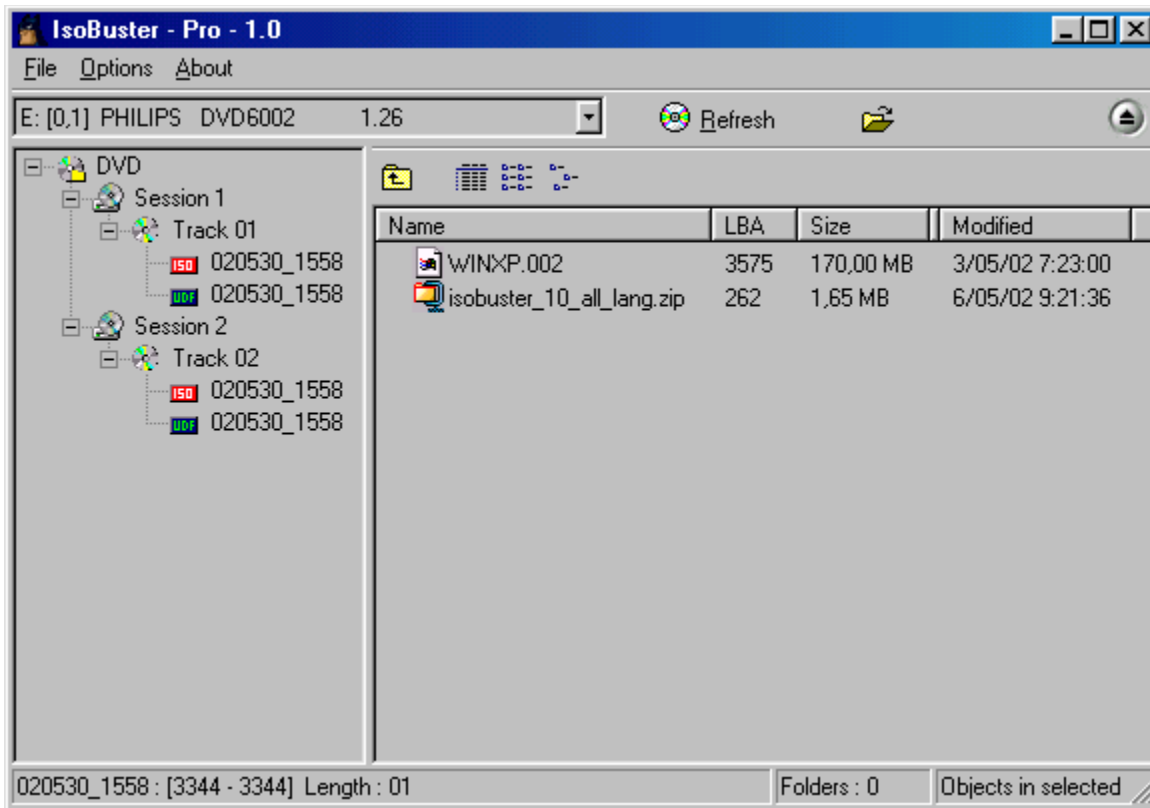


Image File Layout

An Image File is a single file that contains the complete CD content ordered in the same way as it appears on CD or DVD.

A CD or DVD contains blocks and so does an Image File.

[If you want to understand the CD / DVD layout better, read this : CD / DVD Layout.](#)

Once a CD / DVD layout is understood there isn't much more to say about Image Files other than that despite the simpleness of a CD / DVD layout there are **lots** of different Image Files out there.

The most simple ones are the *.iso or *.bin files which are really block per block files. The differences here are the block-size and the amount of leading blocks (sort of header).

The more difficult ones are those thought of by the different Write Application Vendors (*.cif, *.nrg, ...). Again they come in many different formats but they are also not necessarily identical to the CD content. Some of them omit data between tracks or add data in between the (supposing) contiguous data blocks which makes it hard to seek and find the correct data. They contain headers and footers describing the image files layout so that many different formats can exist. Unfortunately there are no Image File specifications. IsoBuster's Image File support is completely done via backwards engineering.

Track and Sector Modes

On **CD**, Blocks and Tracks come in different Modes.

On **DVD** it is simpler. There's only **one** type Track, a **data** Track, and there's only one Data Block Mode.

[To better understand how blocks fit in the picture, read the section about the CD/DVD Layout.](#)

Basically we distinguish two kinds of tracks on CD,

Audio Tracks and **Data Tracks**

Audio Tracks because they contain audio blocks and Data Tracks because they contain data blocks.

In a Track, the mode can **never** change.

Either a track contains all Audio blocks, All Mode 1 blocks or All Mode 2 blocks.

In case of Mode 2 there are however also two possible Forms, Form 1 and Form 2.

Both Form 1 and Form2 can exist together in one track.

So, a track made up of only Audio blocks is called an **Audio Track**.

Audio tracks is what you find on Audio CDs.

A track made up of Data blocks (Mode 1 or Mode2 (Optionally Form 1, Form 2)) is called a **Data Track**.

Data tracks contain the files and folders and Video data.

E.g. Mp3 CDs contain Mp3 files in a data track, there are no Mp3 tracks or something like that.

The different Modes that can exist on **CD** :

Audio	(2352 bytes / block User Data,	2352 Bytes / block Raw data)
Mode 1	(2048 bytes / block User Data,	2352 Bytes / block Raw data)
Mode 2	(2336 bytes / block User Data,	2352 Bytes / block Raw data)
Mode 2 Form 1	(2048 bytes / block User Data,	2352 Bytes / block Raw data)
Mode 2 Form 2	(2324 bytes / block User Data,	2352 Bytes / block Raw data)

On **DVD** :

DVD mode (2048 bytes / block User Data, --- Bytes / block Raw data (There's no such thing as Raw on DVD))

Mode 1 (M1) and Mode 2 Form 1 (M2F1) are the two modes that contain the normal data we are all used of.

This is because these blocks are the best protected. The remainder of the raw data is used to apply a third layer error correction.











The other modes don't have this third layer error correction.

If you read a data CD with Windows, you can bet the data is in M1 or M2F1 sectors. Windows doesn't allow anything else **except** on certain CD layouts ([VCD](#)).

Video data on [VCD](#) and [SVCD](#) is mostly located in M2F2 sectors. This is because more data fits in these blocks. The disadvantage is no third layer error correction but a green flash once in a while in the Video stream is acceptable I guess. Windows will normally not allow to read files which are recorded in these kinds of blocks. Only if a VCD, SVCD layout is recognised will Windows allow to read and play the *.dat files containing the movie. IsoBuster of course extracts everything. [In this case I suggest you read the Extraction Options part to better understand the options.](#)

Icons next to files, folders and tracks

For following icons :

-  Red Icon containing text 'ISO'
-  Blue and Red Icon containing '>>>'
-  Blue Icon containing '>>>'
-  Black Icon containing text 'RR'
-  Black Icon containing text 'CD-i'
-  Blue Icon containing text 'UDF'
-  Yellow Icon containing text 'UDF'
-  Blue Icon containing text 'UDF'
-  Multi-colored Apple Icon next to one of the other Icons in this list
-  Superman sign icon

[Go see : File Systems](#)

Other icons :

 Blue Plus Icon

This icon can be placed next to a file or folder.

It means that the file or folder is fragmented over the optical disc.

Instead of one or a series of succeeding blocks the file or the file describing a folder is located at different locations.

E.g. if a file is partly located in a (defect management) sparing area you would see this.

Also in case of UDF or UDF converted to ISO you see this a lot for large files that couldn't be recorded in one go.

 Red Plus Icon

This icon can be placed next to a track a session or a file icon.

It means that IsoBuster felt the need to compensate or alter what the drive returned to get to the data.

E.g. [CD-i](#) discs are often not correctly recognised by CD/DVD-ROM drives and IsoBuster tries to

compensate for that (possibly assumes tracks at certain locations) to be able to give access to the data.

 Error Icon (this icon has priority over all other icons)

If during a scan physical errors were encountered and if the file is located in such erroneous sectors, then this icon will be placed next to the file. It indicates that there will be difficulties extracting the file and that after extraction the file might be corrupt.

This icon is only put next to a file if a physical scan was initiated first. There are several ways to do this :

- [Find Missing Files and Folders](#)
- [Check if all files are physically readable](#)
- [Perform a surface scan](#)

 Blue Arrow Icon with text 'E'

This icon is purely informative and shows that the file is preceded by an Extended Attribute Record.

This Extended Attribute Record (XAR) contains extra data per file but doesn't really belong to the file.

It is used by certain OS but definitely not Windows.

 Multi-coloured Apple Icon next to a file

When the icon is placed next to a file it means that the [ISO9660 File System](#) describing the file contained special Apple extensions.



Windows Icon

This icon can be placed next to a File System icon (See the icons on top of this page). It is displayed when in the [File System settings dialog Little Endian](#) is selected for that File System.

Play CD Audio

IsoBuster supports Analog Play Audio.
Right click and Audio Track and select Play Audio.

This will instruct the CD playback device (CD/DVD-ROM drive) to play the audio analogue.

Pros en cons :

Pro :

- Drive does it all. The system resources are not used at all
- It also works via the front jack of your CD/DVD-ROM
- No Digital Audio Extraction done by the system at high speed.
- Drive can play at 1x, so no spinning noises etc.

Con :

- (*)The audio cable needs to be connected at the back of the CD/DVD-ROM drive and must be connected to the Audio card.

FYI, all devices have such an audio output and all Audio cards have such an input.

(*) That is if you want to hear the sound via the sound card and boxes (not if you want to listen through the front audio jack).

If you're wondering, Analogue Audio playback is what is done by Windows 95 and 98.

As of Windows ME however, Audio playback is done digitally which means that Windows is actually reading the audio data and is processing and converting the data by itself. As of WinXP the user can choose again in the advanced device properties.

Reading the Audio data is also known as DAE (Digital Audio Extraction). It is what IsoBuster does when it converts a track to a wave file, it is what other programs do when they rip the audio (e.g. to convert to mp3).

CD-Text

CD-Text is extra Text information which can be encoded on Audio CDs.
There's the possibility to have text from the Album and text for every [Track](#) separately.

This text is encoded in the [subchannel](#) data in the [lead-in](#) of an audio CD.

IsoBuster finds and decodes CD-Text information automatically when :

- The CD/DVD-ROM drive supports it !
- There is actually CD-Text encoded on the Audio CD.
- There is CD-Text in a *.pxi image file.

Although CD-Text exists for a quite while already, not many CD/DVD-ROM drives support reading it.
That is changing however and if you buy a drive today chances are the drive does support CD-Text.

The same applies to Audio CDs with CD-Text. There really aren't that many CD-Text Audio CDs out there.

The screenshot shows the IsoBuster - Pro - 1.0 application window. The title bar reads "IsoBuster - Pro - 1.0". The menu bar includes "File", "Options", and "About". The main window displays the drive "E: [0.1] PHILIPS DVD6002" with a "Refresh" button. The left sidebar shows a tree view for "SYSTEM OF A DOWN - Session 1" with tracks listed: PRISON SONG, NEEDLES, DEER DANCE, JET PILOT, X, CHOP SUEY!, BOUNCE, FOREST, ATWA, SCIENCE, SHIMMY, TOXICITY, PSYCHO, and AERIALS. The main pane shows a table with columns "Name", "LBA", "Size", and "Size (Bytes)". The table lists the same tracks as the sidebar, each with its corresponding LBA, size in MB, and size in bytes. The status bar at the bottom shows "Track 07 : [76920 - 85486] Length : 8567", "Folders : 0", and "Objects in selected".

Name	LBA	Size	Size (Bytes)
PRISON SONG	0	33,90 MB	35.543.424
NEEDLES	15112	32,60 MB	34.181.616
DEER DANCE	29645	29,45 MB	30.881.760
JET PILOT	42775	21,28 MB	22.308.720
X	52260	19,95 MB	20.913.984
CHOP SUEY!	61152	35,37 MB	37.086.336
BOUNCE	76920	19,22 MB	20.149.584
FOREST	85487	40,39 MB	42.354.816
ATWA	103495	29,64 MB	31.081.680
SCIENCE	116710	27,43 MB	28.764.960
SHIMMY	128940	18,68 MB	19.592.160
TOXICITY	137270	36,83 MB	38.619.840
PSYCHO	153690	38,00 MB	39.847.584
AERIALS	170632	62,42 MB	65.451.456

CD-i & VCD

CD-i

If you really want to know just about anything there is to know about CD-i ...

Check out : <http://www.icdia.org>

CD-i is an old Philips Standard and is actually called CD Interactive.
CD-i discs were made for the CD-i consoles and are according to the 'Green book' standard.

Because CD-i discs were designed to play only on CD-i players, deviations from normal CD standards were allowed. The new standard was called '[Green book](#)'.

The [TOC](#) on a CD-i disc does **not** contain an entry for the data track(s). Only audio tracks can be in the [TOC](#).

Consequence is that not many CD/DVD-ROM drives see a track on the CD-i disc and **if** they do they often get the start address and length wrong. IsoBuster however tries to compensate for that but if the drive (because the TOC is not right) refuses to do anything or read right or whatever still recognising problems can occur. Therefore it's often a good idea to try and read the CD-i disc in more than one system. Some drives do it better than others.

If the CD-i disc does only contain data tracks you have the best chance of being able to mount the media and browse the content.

If there are audio tracks on the CD-i it will get extremely difficult to find a drive which is able to read the CD-i correctly.

Reason for this is that the data track is not in the [TOC](#) but the audio tracks are, so almost all CD/DVD-ROM drives consider the CD-i to contain audio only (so in fact [an audio CD](#)). Trying to read data from an audio CD is then not allowed by the units.

Still it depends a bit on the layout (some CD-i discs are finalised as CD-i (then it might still work) but often they are actually finalised as CD-ROM/CDDA discs so that they can play on standard audio players also).

With CD-i recognition there are no guarantees and it will certainly not improve as the format is long 'dead' (Some might disagree ;-)) so modern CD/DVD-ROM drives don't tend to support it anymore.

The File System is also different on a CD-i disc.

[For more about that, check out : File Systems.](#)

A lot of 'Video CDs' were created in this Green book (CD-i) standard. These Video CDs are **not** according to the White Book standard which became **THE** Video CD standard.

So, these CD-i Video CDs don't tend to work on PC (for all the reasons above) but IsoBuster tends to be able to get to the content because in most cases the CD-i discs are finalised as CD-i and the contain Data only.

These CD-i Video Discs do tend to work in standalone Video CD players.

If you extract the mpg from a whitebook VCD 2.0, the mpg will be accepted by all VCD creating Write Software.

If you extract mpg that is not conform VCD 2.0 (e.g. from a CD-i), a lot of VCD creating apps will complain.

However, some of them still allow you to create a VCD from the stream (Yippee) (e.g. WinOnCD, Adaptec VCD Creator 4.0).

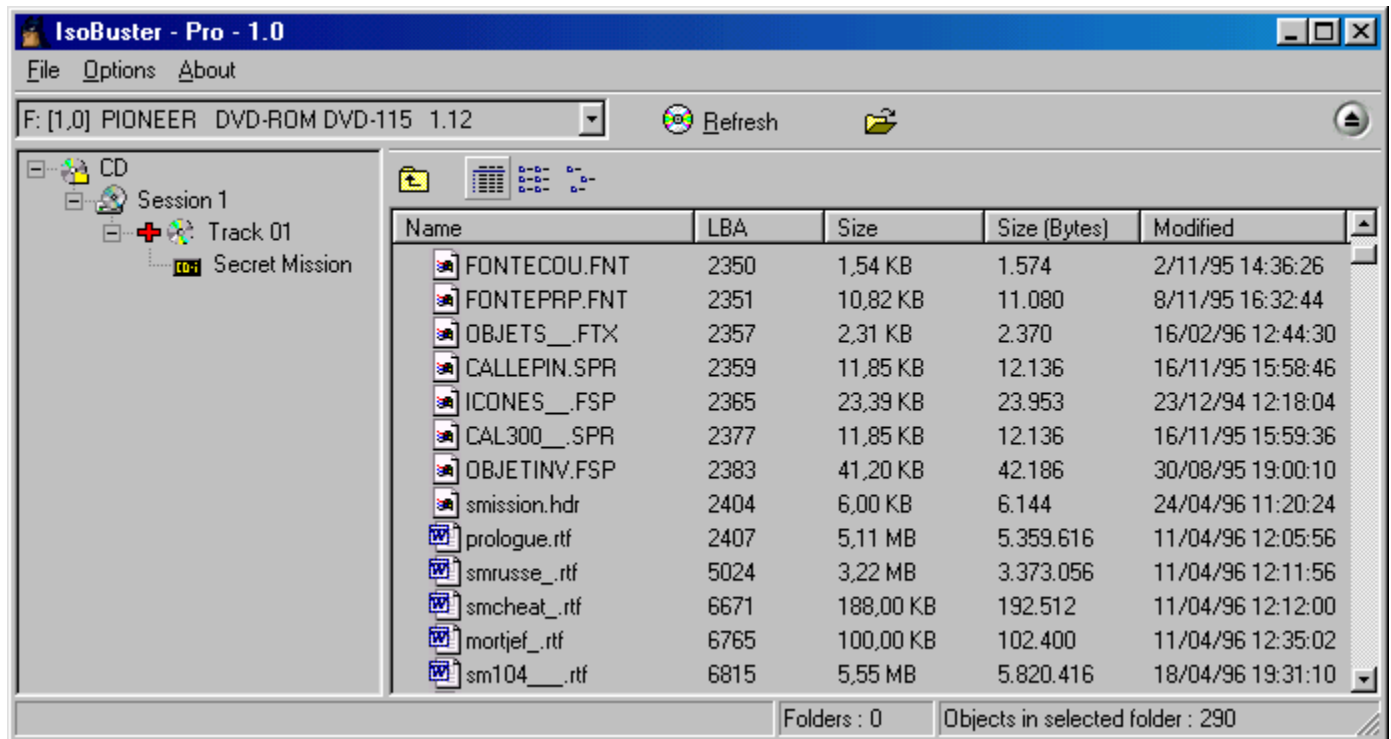
Downside is that CD-i players check for CD format and then determine how the mpg format should look like.

Resultantly, the CD-i player will most likely freeze on this kind of mpg on a CD-ROM.

HOWEVER ... The whole intention of converting to CD-ROM is for the benefit of being able to view the mpg on PC ...

And PC Mpg decoding soft has NO problem with this !!

So, you are now able to 'back-Up' all your favourite CD-i movies to CD-ROMS that can be seen by Windows.



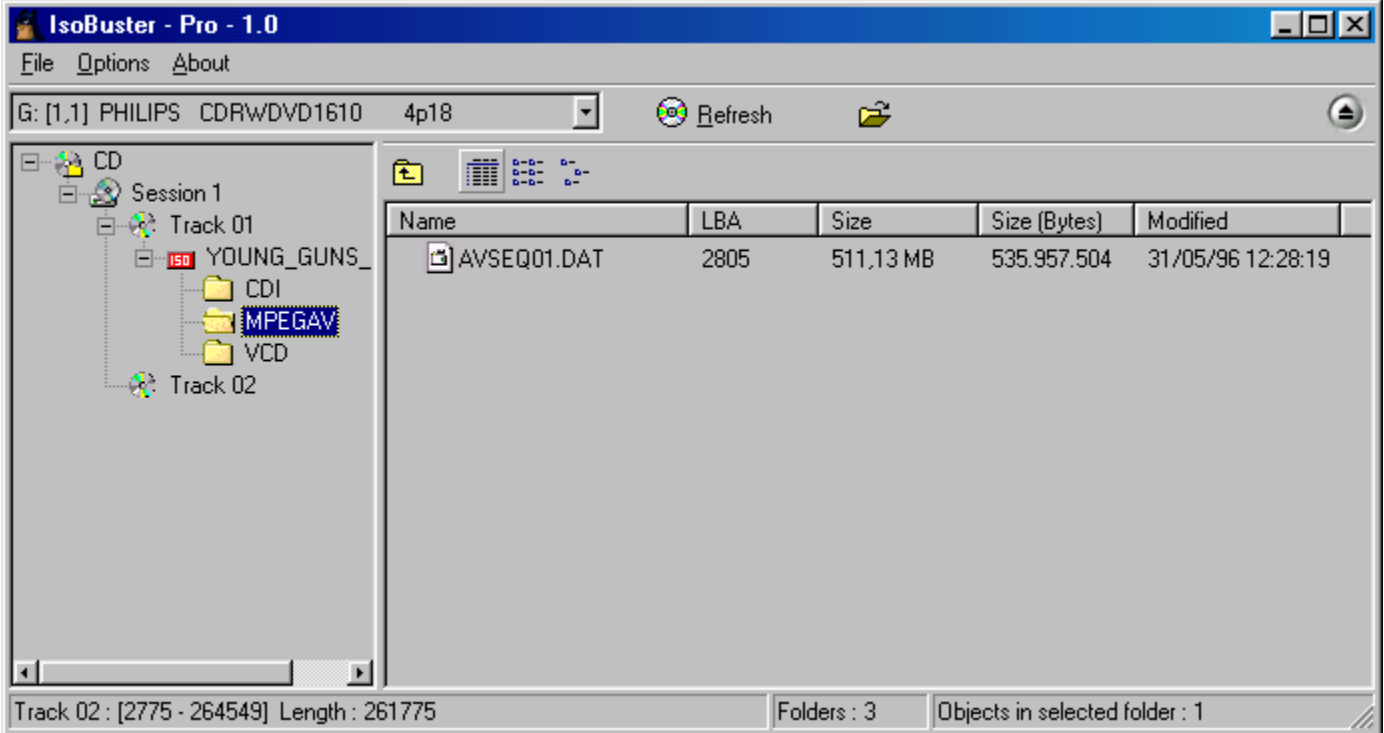
VCD

VCD or Video CD is a standard designed for Video content on CD, playable in standalone VCD players (The ones you place under your Television set). The standard is called '[White book](#)'. White book VCDs are not to be mistaken for Green book Video CDs.

VCDs are completely compatible with normal data CDs and the content should be easily accessible. The [File System](#) on these CDs should be [ISO9660](#) although occasionally one finds them with a [Joliet](#) File System (in addition to ISO9660) also.

VCD CDs contain a fixed file and directory layout. A CDI folder with content so that the VCD can be played in [CD-i](#) consoles as well and an MPEGAV folder containing the actual Video File (a *.DAT file). This *.DAT file references data which is located in the second (and higher tracks if available). The second and higher data [tracks](#) on VCDs contain the actual Video data, mainly in [M2F2](#) sectors which can be interleaved with [M2F1](#) sectors.

So, if the File System is corrupt and one can't find the Video (*.dat) file, '[Extraction of the Mpg data only](#)' from the second or higher tracks is still possible via IsoBuster. IsoBuster features great and proven recovery functionality for this kind of situations.



Directory tree and file information

You are able to extract the Files' layout to a text file or in to the IsoBuster editor and include the [Block Number](#).

The block number is the physical location of the file on the CD.

A low block number is on the beginning of the CD, a high block number is at the end of the CD.

This option is especially handy for people that want to understand the logical order of files on a CD or DVD.

Imagine, you have an mp3 CD and an mp3 player but the mp3 player plays the mp3 files in the physical order they are placed on CD.

If you inspect the CD content via Windows you see that the files are **not** in the order they are played.

This is because Windows sorts the files and they may also be arranged in another way in the [File System](#) as well.

Here such a file list comes in very handy !

It's easy to import in a MS Excel document and sort on the fields you like.

An almost similar option exists to copy the tree information of all **erroneous** files. These are files that are located (fully or partially) in sectors that are physically unreadable. This option doesn't mention the block number but just lists the affected files. The option to list these files only becomes available after a scan (which detects the errors) :

- [Find Missing Files and Folders](#)
- [Check if all files are physically readable](#)
- [Perform a surface scan](#)

The screenshot shows the IsoBuster - Pro - 1.4 application window. The main window displays a file list with columns for LBA, Size, Size (Bytes), and Modified. A context menu is open over the file list, showing options like 'Extract NEW', 'Directory tree and file information', and 'Check if all files are physically readable'. The 'Directory tree and file information' option is selected, and a sub-menu is visible with options like 'List tree-info (in txt file)', 'List tree-info (in Edit Window)', 'List files with read errors (in txt file)', and 'List files with read errors (in Edit Window)'. The 'List tree-info (in Edit Window)' option is further expanded to show 'LBA, Full Path', 'LBA, Relative Path', and 'LBA, File'.

	LBA	Size	Size (Bytes)	Modified
	606	65,94 KB	67.527	29/04/02 21
	639	62,21 KB	63.702	14/06/02 19
	671	58,58 KB	59.981	14/06/02 19
	701	60,40 KB	61.848	14/06/02 19
	732	59,46 KB	60.886	14/06/02 19
	762	60,07 KB	61.513	14/06/02 19
	792	61,75 KB	63.230	14/06/02 19
	944	59,32 KB	60.747	14/06/02 19
	974	59,73 KB	61.162	14/06/02 19
	1124	57,73 KB	59.118	14/06/02 19

An example of a file dump :

LBA , File Name

0330412 , E:\CLOCK.WAV
0215836 , E:\Data\Data\Data\Data\Image-File.iso
0228850 , E:\Data\Data\Data\Data\teaser_3.exe
0244480 , E:\Data\Data\Data\Image-File.iso
0257494 , E:\Data\Data\Data\teaser_3.exe
0273124 , E:\Data\Data\Image-File.iso
0286138 , E:\Data\Data\teaser_3.exe
0301768 , E:\Data\Image-File.iso
0314782 , E:\Data\teaser_3.exe
0330456 , E:\MAGIC.WAV
0330529 , E:\ROLLDOWN.WAV
0330532 , E:\SIREN.WAV
0330544 , E:\SOUNDER.WAV
0330583 , E:\SOUNDPLY.WAV
0330627 , E:\SPARKLE.WAV
0330421 , E:\dog.wav
0000039 , E:\dump\Data\Data\Data\Data\Data\Image-File.iso
0013053 , E:\dump\Data\Data\Data\Data\Data\teaser_3.exe
0028683 , E:\dump\Data\Data\Data\Data\Image-File.iso
0041697 , E:\dump\Data\Data\Data\Data\teaser_3.exe
0057327 , E:\dump\Data\Data\Data\Image-File.iso
0070341 , E:\dump\Data\Data\Data\teaser_3.exe
0085971 , E:\dump\Data\Data\Image-File.iso
0098985 , E:\dump\Data\Data\teaser_3.exe
0114615 , E:\dump\Data\Image-File.iso
0127629 , E:\dump\Data\teaser_3.exe
0143259 , E:\dump\Image-File.iso

Options

- [Set the preferred communication layer and/or Read Settings](#)
- [Play with File System settings](#)
- [Choose your language](#)

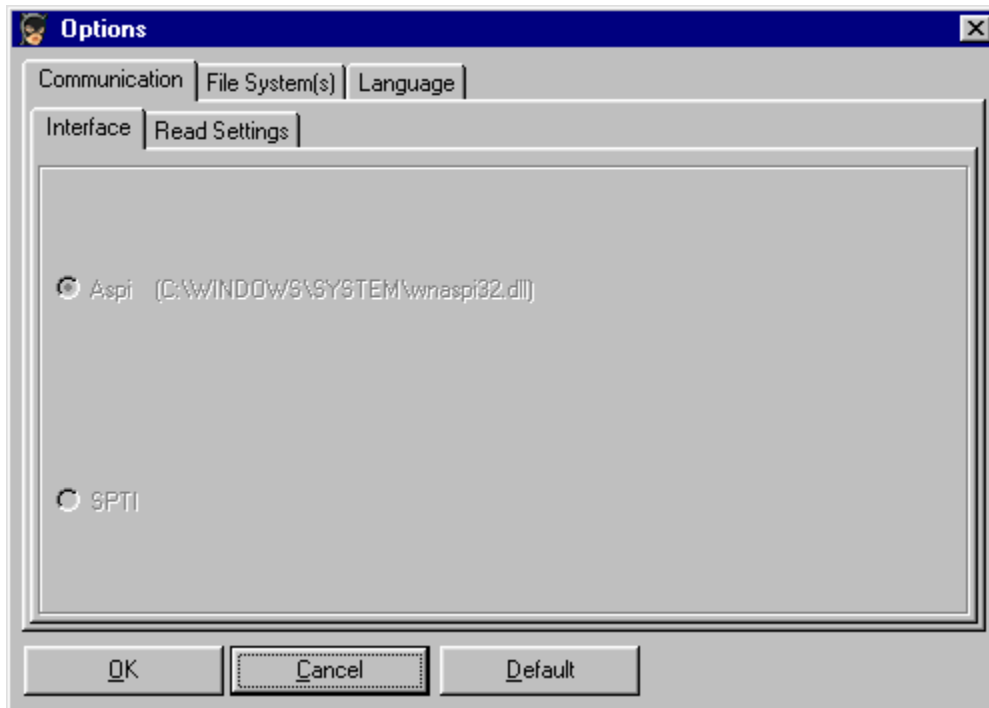
Communication

Interface

IsoBuster is able to communicate directly with CD/DVD-ROM devices and hooks in the system right above the device driver.

This is done without the need to install proprietary drivers.

IsoBuster makes use of Aspi (An Adaptec interface) or SPTI an NT native interface.



Aspi (wnaspi32.dll) is standard installed on Windows 95, 98 and ME.

Microsoft did Adaptec a big favour here and the nice thing about it is that we can make use of it as well.

This interface is default selected under Windows 95, 98 and ME.

Since SPTI cannot work under these OS, the option to select SPTI is greyed out.

Updates for Aspi can be found on the Adaptec website.

IsoBuster is able to work correctly with all versions of Aspi, starting from the oldest Windows 95 version to the newer Windows ME version or the versions downloadable from the Adaptec Website.

Sometimes Aspi can become corrupt because some applications install older parts of Aspi and destroy a good working combination of dll, vxd and registry entries. Funny enough it's often Easy CD Creator that causes havoc.

When this is the case, one can always download an AspiChk utility from the Adaptec Website and check the installation. Or just run an update from the Adaptec website.

When IsoBuster doesn't find your drives or when IsoBuster crashes while starting up (only seen this happen once), try to determine if the Aspi layer is working correctly ! If the interface 'seems' to work properly (because it says so to IsoBuster) but then decides to crash when IsoBuster sends through the first command then there's little IsoBuster can do about it !

Ahead (www.ahead.de) also offers a wnaspi32.dll with an almost exact interface.

IsoBuster works great with all versions of this dll too !

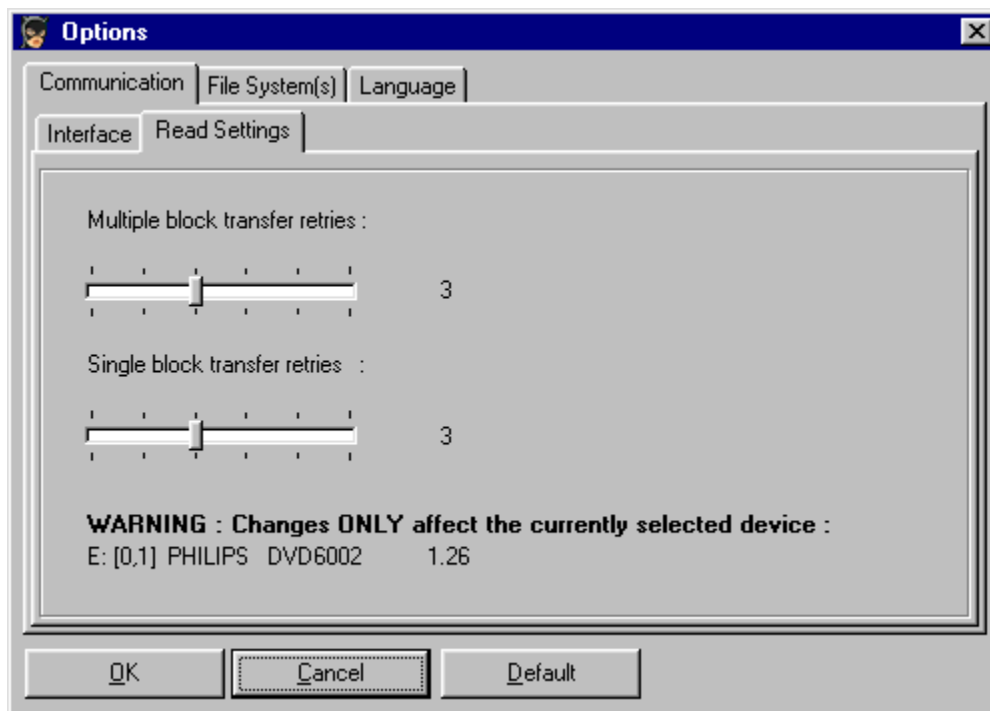
SPTI or **SCSI Pass Through Interface** is standard available on Windows NT4, 2K and XP.

Under these OS (NT4, 2K or XP), Aspi is **not** installed by default. However, as a user, you could have installed Aspi or another application might have done it for you. Whether Aspi is installed or not, SPTI is standard used under Windows NT4, 2K and XP. However, if Aspi is installed you can switch between the two interfaces.

There are two types of SPTI, SPTI and SPTI direct.

IsoBuster uses both, taking care of and working around lots of Windows bugs, especially in the first implementations (e.g. NT4).

Read Settings



During reading, IsoBuster will typically (and where possible) read more than one block at a time.

If that fails for some reason IsoBuster will read every block individually.

For both mechanisms a default retry count is set. You can change this per device using the sliders.

This change only affects IsoBuster behaviour, no other application (e.g. the OS itself) is affected !

This setting is not saved and next time when you start up IsoBuster the default setting will be used again.

In case reading takes very long, because there are many errors and the CD/DVD readers needs a long time per block, you could consider to read with a lower retry count. If you notice that with more retries you don't find the data either it is rather safe to go to a lower retry count and it will save you a lot of time.

Worst case, trying to read corrupted data, the drive needs 30 seconds per block. This times the retry count and this times the amount of blocks which ranges from 330,000 (CD) to 2,200,000 (DVD). I don't need to make you a picture of what that can mean to your precious time. Luckily and mostly only a smaller part of the blocks is unreadable, hardly never will all data be too corrupt to read.

File System Settings

IsoBuster is able to interpret a File System using all means a File System offers. Windows tends to use one method only to get to the data whereas IsoBuster uses the different available structures and is able to switch if one doesn't work properly. The user is also able to set one or more options to try and find the ideal setting for a particular disc if the default settings doesn't work properly.

ISO

IsoBuster offers a set of options that apply for the [ISO9660](#) File System and extensions. [Extensions such as Joliet, Rock Ridge and CD-i to a certain extent.](#)

[For an explanation on the possible settings, click here.](#)

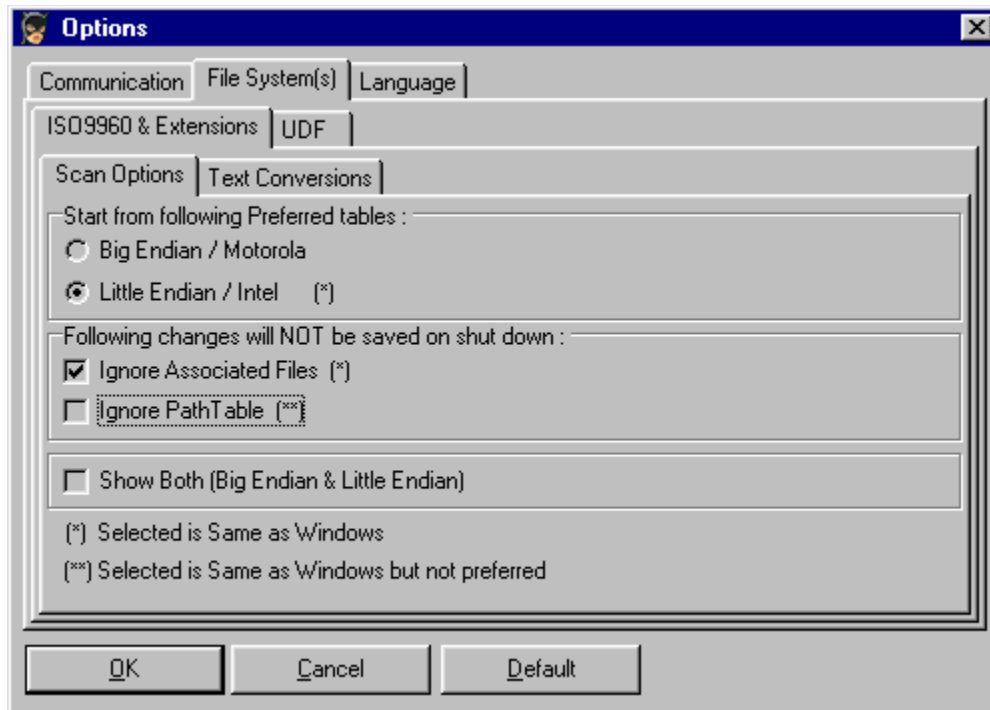
UDF

IsoBuster interprets UDF based on the UDF rules but while doing so also already looks further to see if it can't compensate for errors.

[For an explanation on extra settings, click here.](#)

ISO File System Settings

Scan options



During interpretation of the [File System](#), IsoBuster uses a number of structures and bases its analysis on a number of fields in these structures. So is the [PathTable](#) located in one or more blocks on the CD/DVD and the PathTable contains a list of all the directories.

In fact, there are two PathTables, both on different locations on the disc. One PathTable contains the directory addresses in the [Big Endian](#) notation and the other PathTable contains the addresses in the [Little Endian](#) notation.

The Directory structures also contain the addresses in Big and Little Endian notation, but not in different tables on different locations. One entry contains both the Big and Little Endian notation, it's just a matter of choosing which one to use.

Windows doesn't use the Path Table and directly finds the Root directory in which it only uses the Little Endian addresses.

IsoBuster (by default) does use the PathTable because it is faster and if the Root directory is corrupt, at least the other directories can still be found. IsoBuster uses the Big Endian addresses by default because Windows doesn't use them, so IsoBuster offers an alternative.

However, by means of the Options IsoBuster can be set to use the same methods Windows uses. In those cases the [File System icons](#) will be accompanied by a Windows flag icon.

An exception in all this is the [CD-i File System](#). CD-i requires a PathTable, there's no way without it and CD-i completely relies on the Big Endian addresses. So if Options are selected that contradict with these requirements, then they will be ignored during the CD-i File System interpretation.

Mastering applications tend to neglect the things Windows doesn't use, e.g. the PathTable and the fields containing the Big Endian addresses. Smart Projects watches and tries to steer application vendors in the right direction (with success).

The Options :

Big Endian : The fields containing the [Big Endian](#) addresses and the [PathTable](#) containing the Big Endian addresses will be used. This is the default setting.

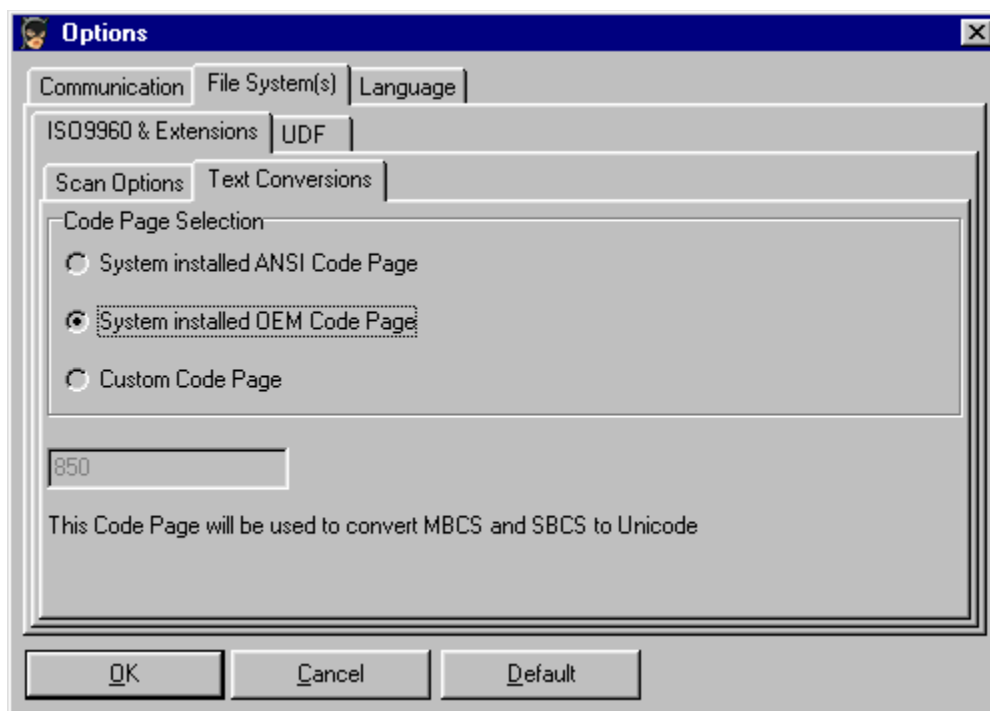
Little Endian : The fields containing the [Little Endian](#) addresses and the [PathTable](#) containing the Little Endian addresses will be used. This is the only setting known to Windows.

Ignore Associated Files : The ISO9660 File System can contain associated files. These files have the exact same name as the file they are associated with. They are only used on Mac and Windows ignores them. IsoBuster can see them if you uncheck this option. If you start extracting all and associated files are present you will be prompted to overwrite as Windows does not accept files with identical names in the same directory. There mostly is no need to uncheck this option unless maybe for engineering purposes or just to see if associated files are present.

Ignore PathTable : This will force IsoBuster to start from the Root directory and forget the PathTable. This will be the same mechanism Windows uses but it is not recommended. It is faster to work with a PathTable. Only uncheck this option if you fear the PathTable is not correct. This will hardly ever be the case (from experience) and this option is more for engineering purposes.

Show both (Big and Little Endian) : This will show the [File System](#) based on the [Big Endian](#) tables and the File System based on the [Little Endian](#) tables (See above for explanation).

Text Conversions :



In the [ISO9660](#) file-system (the red ISO icon next to the root folder), texts are still stored using [SBCS](#) or [MBCS](#) characters.

SBCS (Single Byte Character Set) and MBCS (Multi Byte Character Set) text decoding is based on system installed 'Code Pages'. These Code pages tell the OS but also IsoBuster how to decode the text strings before displaying them on screen. For Latin character texts there really is

no problem,

but for other character texts this often poses difficulties (e.g. Far and Middle East Asia and Europe).

The code page selection feature is there for the following reason :

Some CD Mastering Applications use the ANSI Code page to encode texts in the ISO file system where others use the OEM code page.

Again, for Latin texts no problem, but for some languages (typically texts where more than one byte per character is needed)

decoding then needs to be done using the same code page (which is not recorded on the CD).

If not the same code page is used then, some characters cannot be displayed properly.

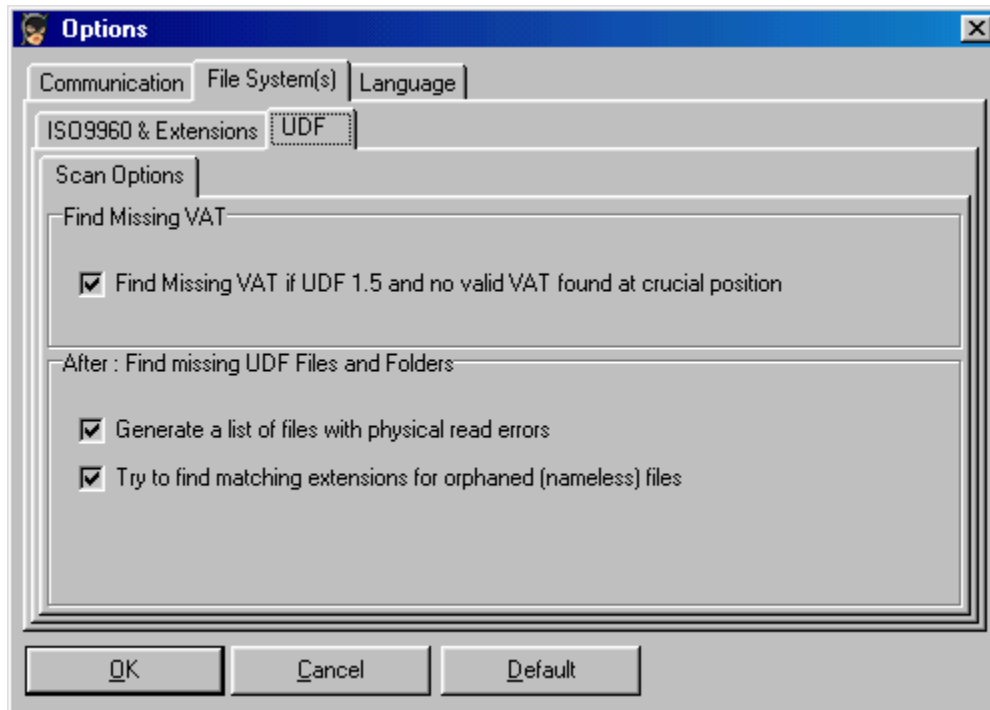
Real life situations encountered, reported by Russian users, using Russian CDs on Russian systems but it's likely these

problems can also occur in the Far and Middle East. Hence this 'neat' feature (in the Options).

This problem does not exist in File Systems using [Unicode](#) (e.g. [Joliet](#)).

Code Page Selection : Select the Code Page you want to use to decode the texts or enter one yourself. This option is really only useful for experienced power users.

UDF File System Settings



IsoBuster interprets UDF based on the UDF rules but while doing so also already looks further to see if it can't compensate for errors. One extra feature which is default set **on** can be switched off. This feature automatically looks for the last valid VAT.

Find Missing VAT

A **VAT** is crucial for sequentially written media (e.g. Drag and Drop applications on write once media (CD-R, DVD+R, DVD-R)).

If a valid UDF file system is found **but** no VAT is found, the file positions can't be determined properly. Therefore, in such a situation, IsoBuster will look for the last valid VAT if there was no VAT where it was supposed to be.

If you run into this problem you stand a good chance that you miss the last added files and folders. At this time it might be wise to scan all using the "[Find Missing Files and Folders](#)" option.

After : Find missing UDF Files and Folders

Generate a list of files with physical read errors

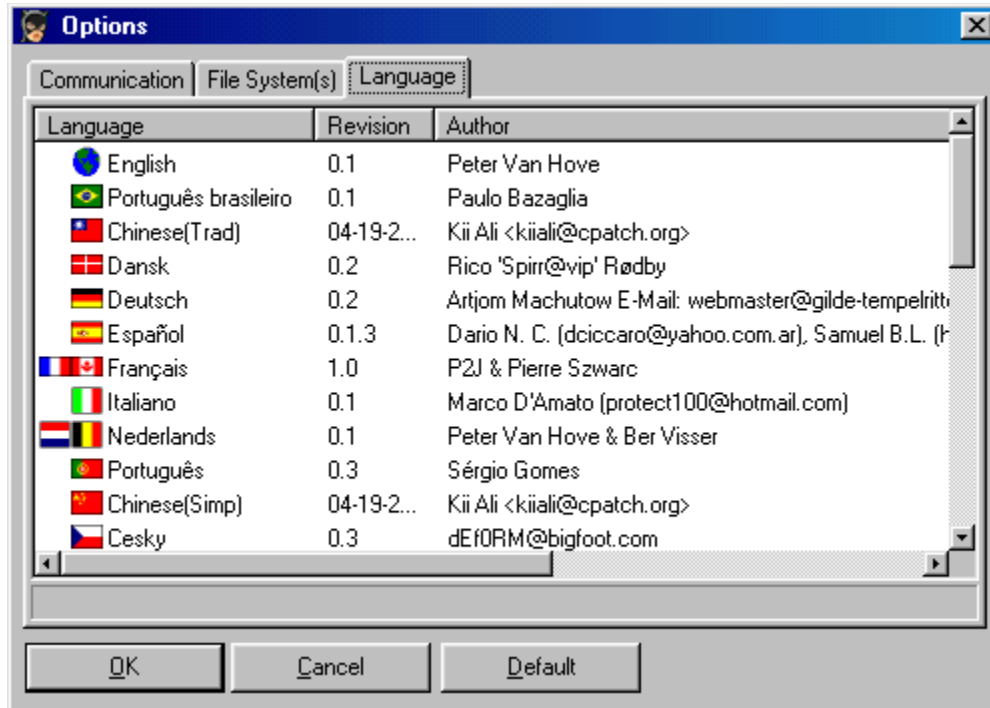
If checked, this option will be executed **automatically** after a Scan for lost files and folders. This list will be compiled **only** if there are indeed files with physical read errors and the list will be displayed in IsoBuster's Edit Window. The functionality is basically the same as what [can be triggered manually](#).

Try to find matching extensions for orphaned (nameless) files

If checked, this option will be executed **automatically** after a Scan for lost files and folders but only if there are really orphaned files. The functionality is the same as what [can be triggered manually](#).

Language Support

IsoBuster is supported in many languages. Last time I counted there were 34 translations.



This is done by means of Language plug ins or dlls.
They can be found in the IsoBuster installation directory, in the 'lang' directory.

Change the language :

To change a language, simply select the language you want and click 'OK' (See picture)
As of now, this language will be used.

For some languages you won't see proper text next to the flag icon. The reason for that is that these languages use code pages that are not supported on your system. E.g. an American version Windows will not support Japanese by default and next to the Japanese flag you will see underscores '_' or question marks '?'. On a Japanese Windows version this will work perfectly of course as the Japanese characters will be shown. These are Windows limitations, no IsoBuster limitations.

Find an updated or new language :

On the [Website](#), the latest versions of the translations can also always be found.
To update a language, simply download the dll and copy the dll in the 'lang' directory.
Click yes when/if Windows prompts to overwrite.
If that doesn't work, the dll might be loaded by a currently running IsoBuster.
In that case, shut down IsoBuster and try again.

For the techies :

All displayed texts in IsoBuster use a MS Windows default font 'MS Sans Serif' and the Charset is set to DEFAULT_CHARSET to be able to cope with all languages on all (many many) language versions of MS

Windows. For the Japanese translation this poses problems as (apparently) the Japanese installation is not able to pick the correct font with these settings. Therefore IsoBuster has been enhanced to dynamically (no user intervention required) change the Charset if needed. This kind of support is done by means of the language dlls and is not something you should worry about.

The people behind the translations :

All translation have been done by people who kindly offered to translate to their native tongue. They did it for free and their help is much appreciated. If you want to be a part of this group and your language is not yet in the list, or you want to be a back up for a language, send an Email to Translate@smart-projects.net to find out if nobody else is already working on a the same language. Details on how to do it can be found on the [Website](#). Just scroll down to the bottom of the page and follow the link.

Bootable CD/DVD

A bootable CD or DVD is build up according to the El Torito standard. This means that the [ISO9660 File System](#) has an extension which provides information to a BIOS so that the BIOS knows where to boot from and what files to load from where.

Bootable CDs or DVDs are a BIOS thing, once the OS is up and running the bootable structures are ignored.

It is not simply possible to copy a bootable floppy image onto CD or DVD and then hope the medium is now bootable.

The File System really needs to know and needs to provide special structures and volume descriptors (in accordance with the El Torito standard).

If you want to create a bootable CD or DVD you need to use a mastering application that does it for you. E.g. in Nero or Easy CD Creator you can check an option to make a bootable CD/DVD and the application will then prompt you to insert a bootable floppy or use a bootable image.

Different ways to go about this :

Extract the bootable CD image file with IsoBuster or ... often the bootable image is also mentioned in the file system as a normal file. In that case ... look for a file of about (mostly) 1.44 MB big and maybe compare the start address of the file to the start address of the boot image given by IsoBuster. If they're the same ... bingo !

Next use a nifty little application called img2dsk (<http://retrograde.trustno1.org/index2.htm>) and place the image file content on a floppy. This little application breaks the image file down in floppy-sized blocks and writes them to the floppy from start till end. When you next browse to the floppy, Windows drivers suddenly can make sense of the data 'et voila' ... you can open/edit/replace the files.

If the layout of the CD is less important...

(only in case of certain copy protections the layout (file locations) is really important))

Extract all files from the CD (using IsoBuster or Windows).

Leave the floppy in the floppy drive and start up your CD Creator application (e.g. Nero, Easy CD Creator, ...)

Re-create the CD from the content you just ripped of the original.

Choose to create a bootable CD. The application will prompt for a bootable floppy (the one you just left in the floppy drive) and you will create the 'same' bootable CD with changed boot properties.

If the location of files may not be changed you'll need to do some engineering ...

Create a new bootable image file from the 'changed' floppy content. You'll need dsk2img for this task.

Create an image file from the CD you want to change. Now (and this is important) you will have a hard time just editing any kind of image file (because of many reason, one of which is error correction code in some image files).

The boot image is 'pure' user data (no overhead) so you best start with an image file which contains the same kind of 'pure' user data. So, extract the image as a *.tao image which is 2048 bytes per block (this is only true for 'true data CDs' (not CD-i or Video CD)).

Use IsoBuster to determine the location of the image file on CD (The Logical Block Address (LBA)).

In the image file, the boot-image file then starts at byte (2048 * LBA).

Use a hex editor and swap the content in the image file with the content of the changed boot image.

Once this is done ... you can use the image file to burn a CD.

Some good online resources on the subject :

<http://www.windowsexp.nu/bootcd>

<http://www.nu2.nu/bootcd/>

<http://www.windows2000faq.com/Articles/Index.cfm?ArticleID=13914>

<http://www.windows-help.net/WindowsXP/winxp-sp1-bootcd.html>

Write Applications and File Systems

This is just a list to understand what [File Systems](#) are put on a CD or DVD when a write application masters the data (not just makes a copy of ... because then no new File System is created, the old one is just copied).

'Classical' data mastering applications (such as Easy CD Creator, Nero, WinOnCD, ...) put on **CD** :

- **ISO9660** Almost **always** (which is a good idea for max. compatibility with other systems)
- **Joliet** Almost **always** (long file names ; not used on VCD (exceptions prove the rule))
- **UDF** **Hardly ever** (Nero offers the option to use it anyway)

'Classical' data mastering applications (such as Easy CD Creator, Nero, WinOnCD, ...) put on **DVD** :

- **ISO9660** Almost **always** (which is a good idea for max. compatibility with other systems)
- **Joliet** Almost **always** (long file names ; not used on Video DVD (exceptions prove the rule))
Some versions of Creator seem to forget this File System which results in no long File Names under Windows NT4 and Windows 95. If UDF is present, IsoBuster comes to the rescue !
- **UDF** Almost **always** (This File System is mandatory on DVD)
Some mastering applications seem to forget this (e.g. Nero) although not a problem for Windows.

Packet writing software on CD and DVD (e.g. Direct CD, InCD, B's gold, DLA, Packet CD, ABCD, ...)

- **UDF** **ALWAYS** (This File System allows to add / delete / change files)
Some or most applications reserve room to be able to convert the UDF file System to another File System
e.g. Iso and Joliet on eject or when the CD / DVD is full.

See '[File Systems](#)' to understand what is what.

Error Codes / Sense Codes

Optical drives return error codes (or Sense codes like they're called in the industry) when something is the matter or just to inform the host (PC, application) of a certain situation.

The standard that describes these messages (amongst other things) is MMC :

MMC-3 Revision 10e

Table A.1
Logical Unit Sense Key, ASC and ASCQ Assignments

SK	ASC	ASCQ	
0	/ 00	/ 00	NO ADDITIONAL SENSE INFORMATION
B	/ 00	/ 06	I/O PROCESS TERMINATED
5	/ 00	/ 11	AUDIO PLAY OPERATION IN PROGRESS
5	/ 00	/ 12	AUDIO PLAY OPERATION PAUSED
5	/ 00	/ 13	AUDIO PLAY OPERATION SUCCESSFULLY COMPLETED
5	/ 00	/ 14	AUDIO PLAY OPERATION STOPPED DUE TO ERROR
5	/ 00	/ 15	NO CURRENT AUDIO STATUS TO RETURN
4	/ 00	/ 17	CLEANING REQUESTED
3	/ 02	/ 00	NO SEEK COMPLETE
2	/ 04	/ 00	LOGICAL UNIT NOT READY, CAUSE NOT REPORTABLE
2	/ 04	/ 01	LOGICAL UNIT IS IN PROCESS OF BECOMING READY
2	/ 04	/ 02	LOGICAL UNIT NOT READY, INITIALIZING CMD. REQUIRED
2	/ 04	/ 03	LOGICAL UNIT NOT READY, MANUAL INTERVENTION REQUIRED
2	/ 04	/ 04	LOGICAL UNIT NOT READY, FORMAT IN PROGRESS
2	/ 04	/ 07	LOGICAL UNIT NOT READY, OPERATION IN PROGRESS
2	/ 04	/ 08	LOGICAL UNIT NOT READY, LONG WRITE IN PROGRESS
4	/ 05	/ 00	LOGICAL UNIT DOES NOT RESPOND TO SELECTION
3	/ 06	/ 00	NO REFERENCE POSITION FOUND
5	/ 07	/ 00	MULTIPLE PERIPHERAL DEVICES SELECTED
4	/ 08	/ 00	LOGICAL UNIT COMMUNICATION FAILURE
4	/ 08	/ 01	LOGICAL UNIT COMMUNICATION TIME-OUT
4	/ 08	/ 02	LOGICAL UNIT COMMUNICATION PARITY ERROR
4	/ 08	/ 03	LOGICAL UNIT COMMUNICATION CRC ERROR (ULTRA-DMA/32)
4	/ 09	/ 00	TRACK FOLLOWING ERROR
4	/ 09	/ 01	TRACKING SERVO FAILURE
4	/ 09	/ 02	FOCUS SERVO FAILURE
4	/ 09	/ 03	SPINDLE SERVO FAILURE
4	/ 09	/ 04	HEAD SELECT FAULT
6	/ 0A	/ 00	ERROR LOG OVERFLOW
1	/ 0B	/ 00	WARNING
1	/ 0B	/ 01	WARNING - SPECIFIED TEMPERATURE EXCEEDED
1	/ 0B	/ 02	WARNING - ENCLOSURE DEGRADED
3	/ 0C	/ 00	WRITE ERROR
3	/ 0C	/ 07	WRITE ERROR - RECOVERY NEEDED
3	/ 0C	/ 08	WRITE ERROR - RECOVERY FAILED
3	/ 0C	/ 09	WRITE ERROR - LOSS OF STREAMING
3	/ 0C	/ 0A	WRITE ERROR - PADDING BLOCKS ADDED
3	/ 11	/ 00	UNRECOVERED READ ERROR
3	/ 11	/ 01	READ RETRIES EXHAUSTED
3	/ 11	/ 02	ERROR TOO LONG TO CORRECT
3	/ 11	/ 05	L-EC UNCORRECTABLE ERROR
3	/ 11	/ 06	CIRC UNRECOVERED ERROR

3 / 11 / 0F	ERROR READING UPC/EAN NUMBER
3 / 11 / 10	ERROR READING ISRC NUMBER
B / 11 / 11	READ ERROR - LOSS OF STREAMING
3 / 15 / 00	RANDOM POSITIONING ERROR
3 / 15 / 01	MECHANICAL POSITIONING ERROR
3 / 15 / 02	POSITIONING ERROR DETECTED BY READ OF MEDIUM
1 / 17 / 00	RECOVERED DATA WITH NO ERROR CORRECTION APPLIED
1 / 17 / 01	RECOVERED DATA WITH RETRIES
1 / 17 / 02	RECOVERED DATA WITH POSITIVE HEAD OFFSET
1 / 17 / 03	RECOVERED DATA WITH NEGATIVE HEAD OFFSET
1 / 17 / 04	RECOVERED DATA WITH RETRIES AND/OR CIRC APPLIED
1 / 17 / 05	RECOVERED DATA USING PREVIOUS SECTOR ID
1 / 17 / 07	RECOVERED DATA WITHOUT ECC - RECOMMEND REASSIGNMENT
1 / 17 / 08	RECOVERED DATA WITHOUT ECC - RECOMMEND REWRITE
1 / 17 / 09	RECOVERED DATA WITHOUT ECC - DATA REWRITTEN
1 / 18 / 00	RECOVERED DATA WITH ERROR CORRECTION APPLIED
1 / 18 / 01	RECOVERED DATA WITH ERROR CORR. & RETRIES APPLIED
1 / 18 / 02	RECOVERED DATA - DATA AUTO-REALLOCATED
1 / 18 / 03	RECOVERED DATA WITH CIRC
1 / 18 / 04	RECOVERED DATA WITH L-EC
1 / 18 / 05	RECOVERED DATA . RECOMMEND REASSIGNMENT
1 / 18 / 06	RECOVERED DATA . RECOMMEND REWRITE
1 / 18 / 08	RECOVERED DATA WITH LINKING
5 / 1A / 00	PARAMETER LIST LENGTH ERROR
4 / 1B / 00	SYNCHRONOUS DATA TRANSFER ERROR
A / 1D / 00	MISCOMPARE DURING VERIFY OPERATION
5 / 20 / 00	INVALID COMMAND OPERATION CODE
5 / 21 / 00	LOGICAL BLOCK ADDRESS OUT OF RANGE
5 / 21 / 01	INVALID ELEMENT ADDRESS
5 / 21 / 02	INVALID ADDRESS FOR WRITE
5 / 24 / 00	INVALID FIELD IN CDB
5 / 25 / 00	LOGICAL UNIT NOT SUPPORTED
5 / 26 / 00	INVALID FIELD IN PARAMETER LIST
5 / 26 / 01	PARAMETER NOT SUPPORTED
5 / 26 / 02	PARAMETER VALUE INVALID
5 / 26 / 03	THRESHOLD PARAMETERS NOT SUPPORTED
5 / 26 / 04	INVALID RELEASE OF ACTIVE PERSISTENT RESERVATION
5 / 27 / 00	WRITE PROTECTED
5 / 27 / 01	HARDWARE WRITE PROTECTED
5 / 27 / 02	LOGICAL UNIT SOFTWARE WRITE PROTECTED
5 / 27 / 03	ASSOCIATED WRITE PROTECT
5 / 27 / 04	PERSISTENT WRITE PROTECT
5 / 27 / 05	PERMANENT WRITE PROTECT
7 / 27 / 06	CONDITIONAL WRITE PROTECT
6 / 28 / 00	NOT READY TO READY CHANGE, MEDIUM MAY HAVE CHANGED
6 / 28 / 01	IMPORT OR EXPORT ELEMENT ACCESSED
6 / 29 / 00	POWER ON, RESET, OR BUS DEVICE RESET OCCURRED
6 / 29 / 01	POWER ON OCCURRED
6 / 29 / 02	SCSI BUS RESET OCCURRED
6 / 29 / 03	BUS DEVICE RESET FUNCTION OCCURRED
6 / 29 / 04	DEVICE INTERNAL RESET
6 / 2A / 00	PARAMETERS CHANGED
6 / 2A / 01	MODE PARAMETERS CHANGED
6 / 2A / 02	LOG PARAMETERS CHANGED
6 / 2A / 03	RESERVATIONS PREEMPTED
5 / 2B / 00	COPY CANNOT EXECUTE SINCE INITIATOR CANNOT DISCONNECT
5 / 2C / 00	COMMAND SEQUENCE ERROR

5 / 2C / 03	CURRENT PROGRAM AREA IS NOT EMPTY
5 / 2C / 04	CURRENT PROGRAM AREA IS EMPTY
6 / 2E / 00	INSUFFICIENT TIME FOR OPERATION
6 / 2F / 00	COMMANDS CLEARED BY ANOTHER INITIATOR
2 / 30 / 00	INCOMPATIBLE MEDIUM INSTALLED
2 / 30 / 01	CANNOT READ MEDIUM . UNKNOWN FORMAT
2 / 30 / 02	CANNOT READ MEDIUM . INCOMPATIBLE FORMAT
2 / 30 / 03	CLEANING CARTRIDGE INSTALLED
2 / 30 / 04	CANNOT WRITE MEDIUM . UNKNOWN FORMAT
2 / 30 / 05	CANNOT WRITE MEDIUM . INCOMPATIBLE FORMAT
2 / 30 / 06	CANNOT FORMAT MEDIUM . INCOMPATIBLE MEDIUM
2 / 30 / 07	CLEANING FAILURE
5 / 30 / 08	CANNOT WRITE . APPLICATION CODE MISMATCH
5 / 30 / 09	CURRENT SESSION NOT FIXATED FOR APPEND
5 / 30 / 10	MEDIUM NOT FORMATTED
3 / 31 / 00	MEDIUM FORMAT CORRUPTED
3 / 31 / 01	FORMAT COMMAND FAILED
3 / 31 / 02	ZONED FORMATTING FAILED DUE TO SPARE LINKING
/ 34 / 00	ENCLOSURE FAILURE
/ 35 / 00	ENCLOSURE SERVICES FAILURE
/ 35 / 01	UNSUPPORTED ENCLOSURE FUNCTION
/ 35 / 02	ENCLOSURE SERVICES UNAVAILABLE
/ 35 / 03	ENCLOSURE SERVICES TRANSFER FAILURE
/ 35 / 04	ENCLOSURE SERVICES TRANSFER REFUSED
1 / 37 / 00	ROUNDED PARAMETER
5 / 39 / 00	SAVING PARAMETERS NOT SUPPORTED
2 / 3A / 00	MEDIUM NOT PRESENT
2 / 3A / 01	MEDIUM NOT PRESENT - TRAY CLOSED
2 / 3A / 02	MEDIUM NOT PRESENT - TRAY OPEN
6 / 3B / 0D	MEDIUM DESTINATION ELEMENT FULL
6 / 3B / 0E	MEDIUM SOURCE ELEMENT EMPTY
6 / 3B / 0F	END OF MEDIUM REACHED
6 / 3B / 11	MEDIUM MAGAZINE NOT ACCESSIBLE
6 / 3B / 12	MEDIUM MAGAZINE REMOVED
6 / 3B / 13	MEDIUM MAGAZINE INSERTED
6 / 3B / 14	MEDIUM MAGAZINE LOCKED
6 / 3B / 15	MEDIUM MAGAZINE UNLOCKED
4 / 3B / 16	MECHANICAL POSITIONING OR CHANGER ERROR
5 / 3D / 00	INVALID BITS IN IDENTIFY MESSAGE
2 / 3E / 00	LOGICAL UNIT HAS NOT SELF-CONFIGURED YET
4 / 3E / 01	LOGICAL UNIT FAILURE
4 / 3E / 02	TIMEOUT ON LOGICAL UNIT
6 / 3F / 00	TARGET OPERATING CONDITIONS HAVE CHANGED
6 / 3F / 01	MICROCODE HAS BEEN CHANGED
6 / 3F / 02	CHANGED OPERATING DEFINITION
6 / 3F / 03	INQUIRY DATA HAS CHANGED
4 / 40 / NN	DIAGNOSTIC FAILURE ON COMPONENT NN (80H-FFH)
5 / 43 / 00	MESSAGE ERROR
4 / 44 / 00	INTERNAL TARGET FAILURE
B / 45 / 00	SELECT OR RESELECT FAILURE
4 / 46 / 00	UNSUCCESSFUL SOFT RESET
4 / 47 / 00	SCSI PARITY ERROR
B / 48 / 00	INITIATOR DETECTED ERROR MESSAGE RECEIVED
B / 49 / 00	INVALID MESSAGE ERROR
4 / 4A / 00	COMMAND PHASE ERROR
4 / 4B / 00	DATA PHASE ERROR
4 / 4C / 00	LOGICAL UNIT FAILED SELF-CONFIGURATION

B / 4D / NN TAGGED OVERLAPPED COMMANDS (NN = QUEUE TAG)
 B / 4E / 00 OVERLAPPED COMMANDS ATTEMPTED
 3 / 51 / 00 ERASE FAILURE
 3 / 51 / 01 ERASE FAILURE - INCOMPLETE ERASE OPERATION DETECTED
 4 / 53 / 00 MEDIA LOAD OR EJECT FAILED
 5 / 53 / 02 MEDIUM REMOVAL PREVENTED
 5 / 55 / 00 SYSTEM RESOURCE FAILURE
 3 / 57 / 00 UNABLE TO RECOVER TABLE-OF-CONTENTS
 6 / 5A / 00 OPERATOR REQUEST OR STATE CHANGE INPUT
 6 / 5A / 01 OPERATOR MEDIUM REMOVAL REQUEST
 6 / 5A / 02 OPERATOR SELECTED WRITE PROTECT
 6 / 5A / 03 OPERATOR SELECTED WRITE PERMIT
 6 / 5B / 00 LOG EXCEPTION
 6 / 5B / 01 THRESHOLD CONDITION MET
 6 / 5B / 02 LOG COUNTER AT MAXIMUM
 6 / 5B / 03 LOG LIST CODES EXHAUSTED
 1 / 5D / 01 FAILURE PREDICTION THRESHOLD EXCEEDED . Predicted Media
 failure
 1 / 5D / 02 LOGICAL UNIT FAILURE PREDICTION THRESHOLD EXCEEDED
 1 / 5D / 03 FAILURE PREDICTION THRESHOLD EXCEEDED . Predicted Spare Area
 Exhaustin
 1 / 5D / FF FAILURE PREDICTION THRESHOLD EXCEEDED (FALSE)
 6 / 5E / 00 LOW POWER CONDITION ON
 6 / 5E / 01 IDLE CONDITION ACTIVATED BY TIMER
 6 / 5E / 02 STANDBY CONDITION ACTIVATED BY TIMER
 6 / 5E / 03 IDLE CONDITION ACTIVATED BY COMMAND
 6 / 5E / 04 STANDBY CONDITION ACTIVATED BY COMMAND
 5 / 63 / 00 END OF USER AREA ENCOUNTERED ON THIS TRACK
 5 / 63 / 01 PACKET DOES NOT FIT IN AVAILABLE SPACE
 5 / 64 / 00 ILLEGAL MODE FOR THIS TRACK
 5 / 64 / 01 INVALID PACKET SIZE
 4 / 65 / 00 VOLTAGE FAULT
 5 / 6F / 00 COPY PROTECTION KEY EXCHANGE FAILURE . AUTHENTICATION FAILURE
 5 / 6F / 01 COPY PROTECTION KEY EXCHANGE FAILURE . KEY NOT PRESENT
 5 / 6F / 02 COPY PROTECTION KEY EXCHANGE FAILURE .KEY NOT ESTABLISHED
 5 / 6F / 03 READ OF SCRAMBLED SECTOR WITHOUT AUTHENTICATION
 5 / 6F / 04 MEDIA REGION CODE IS MISMATCHED TO LOGICAL UNIT REGION
 5 / 6F / 05 LOGICAL UNIT REGION MUST BE PERMANENT/REGION RESET COUNT
 ERROR
 3 / 72 / 00 SESSION FIXATION ERROR
 3 / 72 / 01 SESSION FIXATION ERROR WRITING LEAD-IN
 3 / 72 / 02 SESSION FIXATION ERROR WRITING LEAD-OUT
 5 / 72 / 03 SESSION FIXATION ERROR . INCOMPLETE TRACK IN SESSION
 5 / 72 / 04 EMPTY OR PARTIALLY WRITTEN RESERVED TRACK
 5 / 72 / 05 NO MORE TRACK RESERVATIONS ALLOWED
 3 / 73 / 00 CD CONTROL ERROR
 1 / 73 / 01 POWER CALIBRATION AREA ALMOST FULL
 3 / 73 / 02 POWER CALIBRATION AREA IS FULL
 3 / 73 / 03 POWER CALIBRATION AREA ERROR
 3 / 73 / 04 PROGRAM MEMORY AREA UPDATE FAILURE
 3 / 73 / 05 PROGRAM MEMORY AREA IS FULL
 3 / 73 / 06 RMA/PMA IS ALMOST FULL
 0 / 00 / 00 NO ADDITIONAL SENSE INFORMATION
 B / 00 / 06 I/O PROCESS TERMINATED
 2 / 04 / 00 LOGICAL UNIT NOT READY, CAUSE NOT REPORTABLE
 2 / 04 / 01 LOGICAL UNIT IS IN PROCESS OF BECOMING READY
 2 / 04 / 02 LOGICAL UNIT NOT READY, INITIALIZING CMD. REQUIRED

2 / 04 / 03	LOGICAL UNIT NOT READY, MANUAL INTERVENTION REQUIRED
2 / 04 / 04	LOGICAL UNIT NOT READY, FORMAT IN PROGRESS
2 / 04 / 07	LOGICAL UNIT NOT READY, OPERATION IN PROGRESS
2 / 04 / 08	LOGICAL UNIT NOT READY, LONG WRITE IN PROGRESS
4 / 05 / 00	LOGICAL UNIT DOES NOT RESPOND TO SELECTION
5 / 07 / 00	MULTIPLE PERIPHERAL DEVICES SELECTED
4 / 08 / 00	LOGICAL UNIT COMMUNICATION FAILURE
4 / 08 / 01	LOGICAL UNIT COMMUNICATION TIME-OUT
4 / 08 / 02	LOGICAL UNIT COMMUNICATION PARITY ERROR
6 / 0A / 00	ERROR LOG OVERFLOW
1 / 0B / 00	WARNING
1 / 0B / 01	WARNING - SPECIFIED TEMPERATURE EXCEEDED
1 / 0B / 02	WARNING - ENCLOSURE DEGRADED
5 / 1A / 00	PARAMETER LIST LENGTH ERROR
4 / 1B / 00	SYNCHRONOUS DATA TRANSFER ERROR
5 / 20 / 00	INVALID COMMAND OPERATION CODE
5 / 24 / 00	INVALID FIELD IN CDB
5 / 25 / 00	LOGICAL UNIT NOT SUPPORTED
5 / 26 / 00	INVALID FIELD IN PARAMETER LIST
5 / 26 / 01	PARAMETER NOT SUPPORTED
5 / 26 / 02	PARAMETER VALUE INVALID
6 / 28 / 00	NOT READY TO READY CHANGE, MEDIUM MAY HAVE CHANGED
6 / 29 / 00	POWER ON, RESET, OR BUS DEVICE RESET OCCURRED
6 / 29 / 01	POWER ON OCCURRED
6 / 29 / 02	SCSI BUS RESET OCCURRED
6 / 29 / 03	BUS DEVICE RESET FUNCTION OCCURRED
6 / 29 / 04	DEVICE INTERNAL RESET
6 / 2A / 00	PARAMETERS CHANGED
6 / 2A / 01	MODE PARAMETERS CHANGED
6 / 2A / 02	LOG PARAMETERS CHANGED
6 / 2F / 00	COMMANDS CLEARED BY ANOTHER INITIATOR
/ 34 / 00	ENCLOSURE FAILURE
/ 35 / 00	ENCLOSURE SERVICES FAILURE
/ 35 / 01	UNSUPPORTED ENCLOSURE FUNCTION
/ 35 / 02	ENCLOSURE SERVICES UNAVAILABLE
/ 35 / 03	ENCLOSURE SERVICES TRANSFER FAILURE
/ 35 / 04	ENCLOSURE SERVICES TRANSFER REFUSED
5 / 3D / 00	INVALID BITS IN IDENTIFY MESSAGE
2 / 3E / 00	LOGICAL UNIT HAS NOT SELF-CONFIGURED YET
4 / 3E / 01	LOGICAL UNIT FAILURE
4 / 3E / 02	TIMEOUT ON LOGICAL UNIT
6 / 3F / 00	TARGET OPERATING CONDITIONS HAVE CHANGED
6 / 3F / 01	MICROCODE HAS BEEN CHANGED
6 / 3F / 02	CHANGED OPERATING DEFINITION
6 / 3F / 03	INQUIRY DATA HAS CHANGED
4 / 40 / NN	DIAGNOSTIC FAILURE ON COMPONENT NN (80H-FFH)
5 / 43 / 00	MESSAGE ERROR
4 / 44 / 00	INTERNAL TARGET FAILURE
B / 45 / 00	SELECT OR RESELECT FAILURE
4 / 46 / 00	UNSUCCESSFUL SOFT RESET
4 / 47 / 00	SCSI PARITY ERROR
B / 48 / 00	INITIATOR DETECTED ERROR MESSAGE RECEIVED
B / 49 / 00	INVALID MESSAGE ERROR
4 / 4A / 00	COMMAND PHASE ERROR
4 / 4B / 00	DATA PHASE ERROR
4 / 4C / 00	LOGICAL UNIT FAILED SELF-CONFIGURATION
B / 4D / NN	TAGGED OVERLAPPED COMMANDS (NN = QUEUE TAG)

B / 4E / 00 OVERLAPPED COMMANDS ATTEMPTED
6 / 5A / 00 OPERATOR REQUEST OR STATE CHANGE INPUT
6 / 5A / 01 OPERATOR MEDIUM REMOVAL REQUEST
6 / 5B / 00 LOG EXCEPTION
6 / 5B / 01 THRESHOLD CONDITION MET
6 / 5B / 02 LOG COUNTER AT MAXIMUM
6 / 5B / 03 LOG LIST CODES EXHAUSTED
6 / 5D / 00 FAILURE PREDICTION THRESHOLD EXCEEDED
6 / 5D / FF FAILURE PREDICTION THRESHOLD EXCEEDED (FALSE)
4 / 65 / 00 VOLTAGE FAULT
4 / 00 / 17 CLEANING REQUESTED
3 / 02 / 00 NO SEEK COMPLETE
3 / 06 / 00 NO REFERENCE POSITION FOUND
4 / 09 / 00 TRACK FOLLOWING ERROR
4 / 09 / 01 TRACKING SERVO FAILURE
4 / 09 / 02 FOCUS SERVO FAILURE
4 / 09 / 03 SPINDLE SERVO FAILURE
4 / 09 / 04 HEAD SELECT FAULT
3 / 11 / 00 UNRECOVERED READ ERROR
3 / 11 / 01 READ RETRIES EXHAUSTED
3 / 11 / 02 ERROR TOO LONG TO CORRECT
3 / 11 / 05 L-EC UNCORRECTABLE ERROR
3 / 11 / 06 CIRC UNRECOVERED ERROR
3 / 11 / 0F ERROR READING UPC/EAN NUMBER
3 / 11 / 10 ERROR READING ISRC NUMBER
3 / 15 / 00 RANDOM POSITIONING ERROR
3 / 15 / 01 MECHANICAL POSITIONING ERROR
3 / 15 / 02 POSITIONING ERROR DETECTED BY READ OF MEDIUM
1 / 17 / 00 RECOVERED DATA WITH NO ERROR CORRECTION APPLIED
1 / 17 / 01 RECOVERED DATA WITH RETRIES
1 / 17 / 02 RECOVERED DATA WITH POSITIVE HEAD OFFSET
1 / 17 / 03 RECOVERED DATA WITH NEGATIVE HEAD OFFSET
1 / 17 / 04 RECOVERED DATA WITH RETRIES AND/OR CIRC APPLIED
1 / 17 / 05 RECOVERED DATA USING PREVIOUS SECTOR ID
1 / 17 / 07 RECOVERED DATA WITHOUT ECC - RECOMMEND REASSIGNMENT
1 / 17 / 08 RECOVERED DATA WITHOUT ECC - RECOMMEND REWRITE
1 / 17 / 09 RECOVERED DATA WITHOUT ECC - DATA REWRITTEN
1 / 18 / 00 RECOVERED DATA WITH ERROR CORRECTION APPLIED
1 / 18 / 01 RECOVERED DATA WITH ERROR CORR. & RETRIES APPLIED
1 / 18 / 02 RECOVERED DATA - DATA AUTO-REALLOCATED
1 / 18 / 03 RECOVERED DATA WITH CIRC
1 / 18 / 04 RECOVERED DATA WITH L-EC
1 / 18 / 05 RECOVERED DATA . RECOMMEND REASSIGNMENT
1 / 18 / 06 RECOVERED DATA . RECOMMEND REWRITE
5 / 21 / 00 LOGICAL BLOCK ADDRESS OUT OF RANGE
2 / 30 / 00 INCOMPATIBLE MEDIUM INSTALLED
2 / 30 / 01 CANNOT READ MEDIUM . UNKNOWN FORMAT
2 / 30 / 02 CANNOT READ MEDIUM . INCOMPATIBLE FORMAT
2 / 30 / 03 CLEANING CARTRIDGE INSTALLED
2 / 30 / 07 CLEANING FAILURE
3 / 31 / 00 MEDIUM FORMAT CORRUPTED
2 / 3A / 00 MEDIUM NOT PRESENT
2 / 3A / 01 MEDIUM NOT PRESENT - TRAY CLOSED
2 / 3A / 02 MEDIUM NOT PRESENT - TRAY OPEN
3 / 57 / 00 UNABLE TO RECOVER TABLE-OF-CONTENTS
6 / 5E / 00 LOW POWER CONDITION ON
6 / 5E / 01 IDLE CONDITION ACTIVATED BY TIMER

6 / 5E / 02	STANDBY CONDITION ACTIVATED BY TIMER
6 / 5E / 03	IDLE CONDITION ACTIVATED BY COMMAND
6 / 5E / 04	STANDBY CONDITION ACTIVATED BY COMMAND
5 / 63 / 00	END OF USER AREA ENCOUNTERED ON THIS TRACK
5 / 64 / 00	ILLEGAL MODE FOR THIS TRACK
3 / 73 / 00	CD CONTROL ERROR
3 / 0C / 00	WRITE ERROR
3 / 0C / 07	WRITE ERROR - RECOVERY NEEDED
3 / 0C / 08	WRITE ERROR - RECOVERY FAILED
3 / 0C / 09	WRITE ERROR - LOSS OF STREAMING
3 / 0C / 0A	WRITE ERROR - PADDING BLOCKS ADDED
5 / 27 / 00	WRITE PROTECTED
5 / 27 / 01	HARDWARE WRITE PROTECTED
5 / 27 / 02	LOGICAL UNIT SOFTWARE WRITE PROTECTED
5 / 27 / 03	ASSOCIATED WRITE PROTECT
5 / 27 / 04	PERSISTENT WRITE PROTECT
5 / 27 / 05	PERMANENT WRITE PROTECT
2 / 30 / 04	CANNOT WRITE MEDIUM . UNKNOWN FORMAT
2 / 30 / 05	CANNOT WRITE MEDIUM . INCOMPATIBLE FORMAT
5 / 30 / 08	CANNOT WRITE . APPLICATION CODE MISMATCH
5 / 30 / 09	CURRENT SESSION NOT FIXATED FOR APPEND
5 / 30 / 10	MEDIUM NOT FORMATTED
6 / 5A / 02	OPERATOR SELECTED WRITE PROTECT
6 / 5A / 03	OPERATOR SELECTED WRITE PERMIT
1 / 73 / 01	POWER CALIBRATION AREA ALMOST FULL
3 / 73 / 02	POWER CALIBRATION AREA IS FULL
3 / 73 / 03	POWER CALIBRATION AREA ERROR
3 / 73 / 04	PROGRAM MEMORY AREA UPDATE FAILURE
3 / 73 / 05	PROGRAM MEMORY AREA IS FULL
5 / 2C / 03	CURRENT PROGRAM AREA IS NOT EMPTY
5 / 2C / 04	CURRENT PROGRAM AREA IS EMPTY
3 / 72 / 00	SESSION FIXATION ERROR
3 / 72 / 01	SESSION FIXATION ERROR WRITING LEAD-IN
3 / 72 / 02	SESSION FIXATION ERROR WRITING LEAD-OUT
5 / 72 / 03	SESSION FIXATION ERROR . INCOMPLETE TRACK IN SESSION
5 / 72 / 04	EMPTY OR PARTIALLY WRITTEN RESERVED TRACK

Notes:

1. All values are in hexadecimal
2. When no value for SK is given, the error is applicable to multiple sense keys.

File System

A File System is a combination of structures, records and tables located in different blocks on the CD, possibly scattered all over the CD/DVD.

A CD or DVD can contain several different File Systems so that different OS can use the most suitable one.

A File System should not be mistaken for the CD's [TOC](#) (Table of Contents).

The CD TOC contains the Session and Track Layout. It does not contain any File System.

File Systems reside in the User data portion of the CD or DVD and a drive itself does not know how to interpret them.

It's up to the [host](#) to interpret a File System.

Examples of CD/DVD File Systems : [ISO9660](#), [Joliet](#), [Rock Ridge](#), [CD-i](#), [UDF](#)

Examples of HD or Floppy File Systems : [FAT12](#), [FAT16](#), [FAT32](#), NTFS

Host

Host PC or Host Application (Program) or OS (Operating System) itself.

TOC

Table Of Contents.

Every CD has a TOC and it describes the CD layout (Tracks and Sessions)

DVDs don't have a TOC. The layout is recorded in a different way (DVD Structures).

However, on a ReadTOC command the DVD unit will still respond with valid data. The DVD unit will translate the DVD structure data to a CD TOC before reporting to the [host](#).

Both TOC and DVD Structure are located in the Lead-in of a [session](#).

UDF ISO9660

A CD [File System](#) standard.

It was the first real world-wide adopted CD file system and it was derived from the earlier High Sierra standard.

Files and folders (directories) are still in the DOS 8.3 notation.

The file and folder names are recorded in [SBCS](#) or [MBCS](#).

Maximum directory hierarchy depth can not exceed 8 Levels.

This File System is mandatory available on all CDs.

It is used by DOS, Win3.11, Mac, Sun, Win95 or higher if no [Joliet](#) or [UDF](#) available.

Joliet

A CD [File System](#) standard.

An extension to [ISO9660](#). It is constructed in the same way but with some changes.

Files and folders (directories) can have long file names.

The file and folder names are recorded in [Unicode](#).

Maximum directory hierarchy depth may exceed 8 Levels.

This [File System](#) is extremely popular and 99% of all CDs and DVDs contain it.

([Except Packet written CDs](#)). It is used by Win95, Win98 and higher if no [UDF](#) available.

Rock Ridge

A CD [File System](#) standard.

An extension to [ISO9660](#). It is constructed in the same way but with some changes.

Files and folders (directories) can have long file names.

Maximum directory hierarchy depth may exceed 8 Levels

This [File System](#) is hardly used anymore. It was popular in the Commodore days.

CD-i File System

A CD [File System](#) standard.

This File System resembles [ISO9660](#) but is not entirely the same.

Only CD-i Players know this File System.

Windows does not support this File System.

(There are however [more reasons](#) why Windows has difficulties with CD-i)



UDF

Universal Disc Format
A CD [File System](#) standard.

UDF allows for adding files and folders, and that's why it is used by [Packet Writing Software](#).

This [File System](#) is mandatory on DVDs but also allowed on CDs.
It is known by Win98 if 1.02, known by Win2K if ≤ 1.5 , known by WinXP if ≤ 2.01 (in case the CD / DVD session is closed).

FAT

A [File System](#) standard mainly used on Hard Drives and floppies

E.g. FAT12 on floppy

E.g. FAT16, FAT32 on Hard Drives

DVD-RAM is said to contain FAT32 and Windows XP fully supports FAT32 on Optical Media.

PathTable (PT)

A part of the [ISO9660](#), [Joliet](#), [Rock Ridge](#), [CD-i File System](#) standards.
A collection of structures listing the Folders (directories) only.

Windows 95 and higher ignores the pathtable but other systems use it,
E.g. CD-i and consumer players (e.g. [VCD](#), PCD) depend on it.

MBCS & SBCS & Unicode

MBCS : Multi Byte Character Set

SBCS : Single Byte Character Set

Unicode : Wide Character set (www.unicode.org)

LBA

Logical Block Address

A CD or DVD is divided into blocks.

Each block with a unique address.

There are however different addressing methods.

The Logical address does not necessary match with the Physical address.

A block is also referred to as a frame or sector.

MSF

Minutes Seconds Frames

A CD or DVD is divided into blocks.

Each block with a unique address.

There are however different addressing methods.

MSF is a Physical addressing method.

A frame is also referred to as a block or sector.

$LBA = ((M*60)+S)*75+F-150$

VCD

Video CD.
White Book standard

One session with 2 or more data tracks of which tracks 2 and higher contain mpg1 video in M2F2 sectors.

CD-i

CD Interactive
Green Book standard

CD developed for CD-i players. These CDs contain a [TOC](#) which is different from normal CDs and therefore lots of CD/DVD-ROM players have big problems with these CDs. Especially when the CD-i contains both data and audio. In that case the data can seldom be retrieved using ordinary CD/DVD-ROM units.

There are also CD-i Video CDs out there but they are not according to the [White Book](#) standard.

PCD

Photo CD
A Philips-Kodak standard.

CD-Extra

CD Extra or [Enhanced CD](#) is a standard that covers the following CD layout :

First Session : [All Audio Tracks](#)

Second Session : One or more data tracks which contain the [File System\(s\)](#)

The reason for this is that Audio Players will only see the first session ([Redbook standard](#)) and so will not bother with the data in the second session. An OS however will look for the [File System](#) and will find this in the data track of the second session.

Enhanced CD

Enhanced CD or [CD Extra](#) is a standard that covers the following CD layout :

First Session : [All Audio Tracks](#)

Second Session : One or more data tracks which contain the [File System\(s\)](#)

The reason for this is that Audio Players will only see the first session ([Redbook standard](#)) and so will not bother with the data in the second session. An OS however will look for the [File System](#) and will find this in the data track of the second session.

Audio CD

An audio CD is a CD which contains only audio tracks.
These CDs are manufactured or recorded according to the Redbook standard.
Standalone audio players can be fooled with CD layouts such as [CD-Extra](#).

Audio CDs contain NO data and hence also don't contain File Systems.
There are no files nor folders on these CDs just audio tracks which can be found by interpreting the TOC.

Mixed Mode CD

Mixed Mode CDs are CDs which contain both audio tracks and data track(s) in one session (mostly the first session only).

The first track must be a data track and contains the [File System\(s\)](#)

Older standalone audio players may have problems with the first data track(s). More recent models just skip the first track(s).

Mixed Mode CDs are often used for games that contain both data and audio.

Copy Protected Audio CD

An [Audio CD](#) that can play in a standalone Audio player but not on a PC.

These CDs are per definition NOT complying with the CD standards and rely on CD/DVD-ROM players getting confused.

There are a number of different copy protections out there.

Most of them rely on the fact that standalone audio players only look for audio tracks in the first session (per [Redbook standard](#)) whereas CD/DVD-ROM drives look for ALL sessions and tracks. The copy protected CDs mostly contain one or more higher sessions with incorrect [TOC](#) data per session so that CD/DVD-ROM drives get confused (after all they have to obey the specs to be able to mount all correctly mastered CDs).

Another technique used is to introduce a lot of level 2 errors so that playing analogue audio is not affected but extracting audio is. These CDs better not get scratched and they will ware out fast !!

Being able to extract audio data from these CDs relies largely on the CD/DVD-ROM drive !! IsoBuster can only compensate when the CD/DVD-ROM drives allow for compensation.

SVCD

Super Video CD.

One session with 2 or more data tracks of which tracks 2 and higher contain mpg2 video in M2F2 sectors. Mpg2 is of better quality than Mpg1 but takes up more space. It is the Mpg standard used on Video DVDs as well.

SACD

Super Audio CD.

A CD with two layers. One layer contains the audio in the conventional way ([Audio CD](#)), the other layer contains audio in Mpeg2 (similar to DVD).

Normal CD/DVD-ROM drives should only see one layer and detect the CD as a 'normal' [Audio CD](#).

That seems to work out great except (in my experience) PIONEER DVD-ROM drives have problems. They mistakenly mount the CD as DVD and none of the data is accessible.

Track

A CD or DVD contains Tracks. A track contains 300 or more blocks.

Tracks are located in Sessions and Sessions can contain one or more tracks.

A CD is limited to 99 tracks, a DVD+R or DVD-RW is limited to 191 tracks.

E.g. on an [Audio CD](#) every 'song' will be located in it's own track. Data CDs mostly only contain one data track.

There are two kinds of tracks:

Audio Tracks (containing Audio sectors only)

Data Tracks (can contain M1, M2, M2F1 or M2F2 sectors)

Session

A Session starts with a lead-in and ends with a lead-out and contains one or more tracks.

A CD can contain (in theory) up to 99 Sessions.

Every Session's Lead-in contains a TOC which describes the tracks in the session AND the tracks in the previous sessions.

Block, Frame, Sector

Smallest addressable part of a CD or DVD.
The amount of user data depends on the mode.

Block Mode

A block is recorded in a certain mode.
Audio, M1, M2, M2F1, M2F2, DVD mode

On CD all Blocks contain 2352 bytes.
This is what you end up with if you [extract raw](#).
Depending on the Mode, the user data portion is different.

Furthermore, every block is accompanied by 8 subchannels.
Each subchannel can contain 12 bytes.
The P and Q subchannel bytes are the most important and contain data necessary for correct operation.
They are tampered with the most in case of copy protections. The other subchannels can contain data but are seldom used and not many CD readers can actually correctly retrieve all that data. [CD-Text](#) is located in the subchannel bytes in the [lead-in](#).

On DVD the story is completely different. DVD only knows one Mode (DVD Mode)

Audio

An audio block contains audio only.

The full range of 2352 bytes is used to store 'user data' in.

If you extract Audio as 'user data' or 'raw data' you end up with the same amount of bytes per block.

Audio doesn't have a third layer error correction.

Mode 1 (M1)

Mode1 was the first defined block mode that can contain data.

As you know CD was first designed for Audio only, so afterwards ways were thought of to be able to use the same layout but store data in it.

If extracted raw you end up with 2352 bytes per block.

2048 (2K) bytes are user data (the data you actually find in the files)

The remainder of the data contains : sync bytes, header bytes and third layer error correction bytes (EDC and ECC)

Mode 2 Form 1 (M2F1)

Mode 2 Form 1 is a data mode designed to fit in the Mode2 tracks.

A Track in a certain mode (Audio, M1, M2) HAS to contain block in that same mode.

By changing the form, M2 tracks can contain sectors with Mode 2, Mode 2 Form 1 and Mode 2 Form 2.

If extracted raw you end up with 2352 bytes per block.

2048 (2K) bytes are user data (the data you actually find in the files)

The remainder of the data contains : sync bytes, header bytes, subheader bytes and third layer error correction bytes (EDC and ECC)

This mode is the most popular Data block mode used by write applications. Stamped data CDs are largely still Mode 1.

Mode 2 (M2)

Mode 2 is a data mode designed to be able to store more data per block. Instead of only 2048 'user data' bytes these blocks can store 2336 bytes per block. As a result these blocks don't have a third layer error correction.

If extracted raw you end up with 2352 bytes per block.
If extracted as 'user data' you end up with 2336 bytes per block.

This mode is actually never used and also known as Mode 2 Useless. There's no support for it in File Systems either !

Mode 2 Form 2 (M2F2)

Mode 2 Form 2 is a data mode designed to be able to store more data per block. Instead of only 2048 'user data' bytes these blocks can store 2324 bytes per block. As a result these blocks don't have a third layer error correction.

If extracted raw you end up with 2352 bytes per block.
If extracted as 'user data' you end up with 2324 bytes per block.

This mode is THE mode used to store Video Data in (VCD, SVCD, CD-i)
This mode is often used in combination with M2F1 in the same track.
In that case these tracks are often referred to as Mode 2 Mixed mode tracks

DVD Mode

DVD doesn't know all the different modes as there are in the CD world.
There's only one mode with no real name so let's call it DVD mode.

Write applications mostly refer to this mode as Mode 1 but that is not entirely correct.
The block size is 2048 bytes per block (similar to CD).
There is NO way to extract Raw data !

The DVD standard actually uses ECC blocks which contain 32 KB bytes and are 16 times larger than the CD blocks.

The error correction is superior to CD and covers ECC blocks at a time, so over 32 KB instead of 2 KB.
However, for addressing purposes, every ECC block contains 16 addressable blocks of 2048 bytes.

User Data

The user data portion of a block.

Blocks come in many modes and sizes and mostly only a fraction contains the real user data that contains the files and folder data.

Raw Data

The entire block (without any subchannel data)

Blocks come in many modes and sizes and mostly only a fraction contains the real user data that contains the files and folder data.

The raw data also contains the sync, header, subheader and error correction bytes.

Extracting raw is only really useful in case images are extracted.

Extracting files raw is never a good idea EXCEPT for engineering purposes.

Primary Volume Descriptor (PVD)

A part of many File Systems (ISO9660 and extensions, UDF).

In fact, often the File System starts 'here'.

In case the PVD is not found there's often no way to find the rest of the data.

Big endian

WORD : The value occupies two consecutive bytes, with the more significant byte first.

DWORD : The value occupies four consecutive bytes, with the most significant first and the other bytes in order of decreasing significance.

Similar to how a Motorola processor needs to be addressed.

Little Endian

WORD : The value occupies two consecutive bytes, with the less significant byte first.

DWORD :The value occupies four consecutive bytes, with the least significant byte first and the other bytes in order of increasing significance.

Similar to how an Intel processor (or clone) needs to be addressed.

File Entry (FE)

Used by the UDF File System to store data per file and directory in.
Can also exist in an extended format : Extended File Entry (EFE)

An FE can contain the actual file or directory in the same block if the file and FE fit in one single 2KB block.

Partition

Used by the UDF File System.

UDF can contain different partitions.

As of UDF 1.5 there can also be virtual partitions, e.g. VAT and Spring.

Logical Volume Descriptor (LVD)

A critical part of the UDF File System.

Write applications use this block to 'open' and 'close' the UDF File System.

File Set Descriptor (FSD)

A critical part of the UDF File System.

Virtual Allocation Table (VAT)

An important part of the UDF File System.

As of UDF 1.5 a VAT is used to be able to write incrementally on CD-R and DVD+-RW.

It allows for files and folders to be added, changed, deleted,

If the VAT cannot be found or is corrupt, files will be missing.

Sparable area

An important part of the UDF File System.

As of UDF 1.5 CD-RW / DVD+-RW can contain a Sparable area.

This sparable area is used to do defect management on host level.

For drives that have defect management on board (e.g. Mount Rainier, MRW) no host defect management is necessary and applications use UDF 1.02 again which doesn't have a sparable area.

Anchor Volume Descriptor Pointer (AVDP)

An important part of the UDF File System.

This structure is evenly important as the PVD to be able to find the necessary blocks to be able to interpret the File System.

Image File

An image file is a file which contains CD or DVD content block per block.
There are many different flavours out there.

Mount Rainier

A Philips - Sony - Compaq (now HP) - Microsoft standard that defines defect management on optical discs (CD and DVD).

A Mount Rainier capable drive handles defect management without the host needing to bother. Philips promotes the Standard under the Easy Write logo.

Open / Close

Clicking the Open / Close button will open the drive tray when closed and will close the device tray when opened.

If the tray has been locked by another process, IsoBuster will tell you and allow you to eject anyway.

CD / DVD

A CD or a DVD.

Optical media containing audio or data.

Subchannel

Every Block on a CD is also accompanied by 8 subchannels (P, Q, ..., W)

Every Subchannel can contain 12 bytes.

The P and Q subchannels are used for time encoding and are very system critical.

E.g. Copy protections tamper with these channels.

The other subchannels can contain data. E.g. [CD-Text](#) data or Karaoke data.

FAQ

Q1. The Application loaded but NO drives were present in the Selection Combobox ?

IsoBuster uses different ways to communicate with the CD-ROM devices in your system. Under Win95, 98 and ME this will be Aspi (Adaptec), under NT (4.0, Win2K) this will be SPTI (Scsi Pass Trough Interface) by default. If both methods are present on the system IsoBuster allows to switch between them by means of 'Options \ Communication'.

When not all devices or no device at all are found something is most likely wrong with these communication interfaces. Try to upgrade or install Aspi to work around these issues. Contact Smart Projects if you think you've found an issue with Isobuster.

[More Here.](#)

Q2. How do I upgrade or 'fix' my Aspi layer ?

[More Here.](#)

Q3. What File Systems are supported ?

[More Here.](#)

Q4. What about Multi Session ?

All Multi Session CDs are supported. As a result you can see the file-systems per session and can retrieve files you long thought were lost. Even better, if the last session can't be closed (writer problem), that session is still accessible.

[More Here.](#)

Q5. What's the difference with Windows access to the CD ?

IsoBuster communicates directly to the Drive and doesn't use Windows' 'input' on the CD content. Both the [access](#) and [interpretation of the file system](#) are done by this application.

Resultantly this app can read all sectors how and when it wants.

It can 'see' CDs that Windows can't

It can retry as often as it wants and interpret errors how it wants.

[IsoBuster can read/extract a lot more than Windows can ... think VCD, SVCD, CD-i,](#)

Q6. What kind of drives are supported ?

All Atapi drives that conform MMC/SFF8020i (rev 2.6) should work fine.

This means 99 % of the drives manufactured during the last 5 years.

Before that ... you still have a GOOD chance your drive supports the MMC commands.

IsoBuster should now interpret the gross of all CD-ROM drives out there !

Lots of effort is done to assure this.

Q7. What about IDE <-> SCSI ?

Both kind of drives work fine.

A lot of time was invested to make sure SCSI is supported optimally.

Q8. I can select a drive but can't see the file-system on my CD ??

A 1000 possible issues ...

- Or the CD has a file system this app can't deal with ... (unlikely)
- Or the drive doesn't understand the ATAPI commands ...
- Or the CD is beyond recognition (scratches, bad sectors, ...)

Still ... All info is welcome.

Specify CD title, OS it was meant for, Drive characteristics and name.

[More Here.](#)

Q9 I have a CD-i disc that can't be read ?

IsoBuster was tested on a range of 200 different CD-i titles.

They all worked well except for two titles.

After investigation it turned out that the CD-ROM drives just couldn't read the requested sectors, because the sector-layout was FAR beyond specifications or because they contained audio tracks.

e.g. 'Uncover Tatjana' could be read on my Sony drive, but not on my Philips drive.

e.g. 'Het Nationale Muziekkado' couldn't be read on either drive.

Error : 05/64/00 : 'Illegal Mode for this track' (says it all ...)

Actually, 9 out of 10 chances when you have problems reading CD titles, the CD contains Audio tracks !!??

Besides a unique file-system these CDs have a unique Table of Contents (TOC) which fools the gross of all CD-ROM drives. When audio tracks are present, the CD-ROMs often treat the data as audio in the pre-gap which leads to all sorts of data corruption.

[More Here.](#)

Q10 What about interleaved files ?

Not implemented in this application.

I haven't seen such a CD yet and must assume they don't exist.

If this app detects such files, it will add a little square on the left side of the file icon.

Q11. What about Mac CDs ?

Mac CDs that have an ISO file system should be recognisable ?
(lots of Mac CDs will thus not qualify)

Macintosh files are often split in two ... the executable part and the assets part (associated file). Both files have the same filename and are located in the same folder.

Both can be seen and extracted
but at this point this app doesn't automatically merge them.

[More Here.](#)

Q12. What are those different Extraction types ?

[More Here.](#)

Q13. If I Extract the VCD *.dat file, the resulting file is smaller than when I extract with Windows ?

Yep.

Windows, for some stupid reason, copies all sectors raw and adds a header to the file saying so.

This is why you afterwards need tools such as dat2mpg to convert it all again.

[More Here on VCD](#) and [More Here on Extraction methods.](#)

Q14. Mpg frame-rate related issues

[More Here.](#)

Q15. Resulting file contains 0 bytes

If you choose 'Extract but FILTER only M2F2 Mpeg frames' on a file that does NOT contain mpg data, there is nothing to extract

Furthermore ...

'Extract but FILTER only M2F2 Mpeg frames' Extracts mpg data that is formatted as such on the CD (e.g. VCD, SVCD, DVCD), located in M2F2 frames.

*.mpg files on a normal or standard CD will MOST LIKELY not be formatted as such !

These files need to be extracted using the normal 'Extract' option !!

[More Here.](#)

Q16. What about the famous 'mixed form' files on CD-i

No Problemo !

This app reads all sectors raw and extract the user data portion based upon its own interpretation of the sector's form.

[More Here.](#)

Q17. What is that 'Frame' thing you keep referring to ?

A CD contains frames (or blocks), each containing a certain amount of data.

CDs generally contain 333.000 - 360.000 frames

DVDs a lot more

1 LBA (= [Logical Block Address](#)) = 1 Frame.

[More Here.](#)

Q18. And what about DVD ?

[More Here.](#)

Q19. Does this app interpret UDF File Systems ?

Yep !

[More Here.](#)

Q20. Can a CD (or DVD) contain more than one file system ?

Oh Yes !

Trick is that all those File systems must point to the same files and directories.

Sometimes there are deviations where both File systems are different (bad mastering software).

e.g.

DVDs must contain UDF but in most cases they also contain an ISO File System.

Joliet is an extension of ISO and can contain long file-names.

(Most CD-ROMs these days contain the Joliet extension on top of ISO9660)

[More Here.](#)

In case of Multi-Session, each session contains File systems too.

File Systems can often also be interpreted in different ways (several ways to go about it).
Choosing a certain path can lead to different results than when another path was chosen.
E.g. 'same' tables stored on several locations and different address notations (Intel <-> Motorola)

This app for instance interprets ISO in a different way than Windows does !
Mainly for the benefit of reading CD-i and/or giving you the opportunity to read the data anyway if Windows (once again) refuses.

[More Here.](#)

In the TreeView on the left, IsoBuster will add an icon for every (known) file-system it encounters.
In effect you will have multiple pointers to the same files and directories.
Pick the File-system you want (e.g. Long file names <-> short file-names) and explore the CD.
If one reference doesn't work, you have the option to explore via another file-system.
This is a real plus over Windows, since Windows sticks with one file system and doesn't even bother to post an error message when it encountered problems during file-system interpretation.

[More Here.](#)

Q21. Why do I get the DOS file-names when I browse the CD ?

IsoBuster looks for all file-systems it knows.
Standard, 'all' CDs contain an ISO file system
[ISO9660](#) is limited to short file-names.
Extensions such as [Joliet](#) however contain the long file-names.
IsoBuster also cans for Joliet and add a root in the TreeView on the left

[More Here.](#)

Q22. File retrieval from CDs that weren't closed properly by the Write application.

This app can see and retrieve files from CDs that are not closed properly (e.g. after Buffer Underrun).
Limitation in this case is the drive in which you want to 'see' the CD.
A writer has no problems reading these sectors, but a normal CD-ROM might fail !!
In case of Buffer Underrun, the File system most likely will point to files that weren't recorded or were only partly recorded.
Extracting these files will fail with errors such as : 05/21/??, 05/63/??, 06/3B/0F,
In all cases, Isobuster will read as much as possible and in all cases interpret the data that could be read !!!
(Unlike Windows which just stops on the first error)

Q23. Mpg seems screwed up or is causing mpg player to crash

When data is extracted using 'Extract but FILTER only M2F2 Mpeg frames', each frame is checked for a certain signature before it is copied to the resulting file.
Sometimes frames (as part of files that are not really mpg) contain this signature (accidentally). Hence the app thinks it is extracting mpg and the result is not what you expected. (although not encountered yet and probably unlikely to happen)
Even though mpg is only extracted from Mode2Form2 frames.
Also, I did see some strange mpg formats on certain CD-i's (Not movies !) which caused problems with my mpg player as well.
If the mpg is stored in a 'unique' way you can run into all sorts of unpredictable problems, with any app !

A lot depends of the quality of the codecs on your system, since CD-i for instance seems to be able to handle some very different mpg formats.

[More Here on Extraction techniques](#) and [More Here on CD-i and DVD](#).

Q24. File size on HD is different from what this application says !

In an ISO file system, all file-sizes are stored as if the file is residing in [Mode1](#) or [Mode 2 Form 1](#) frames. This means, 2KB per frame. This is needed to be able to calculate the amount of frames that needs to be read !

However, on CD-i and CD-ROM XA discs certain files (e.g. *.dat and possibly *.rtf on Video discs) can reside in [M2F2](#) frames.

So, more user data per frame. Result is a larger file on HD than what IsoBuster says !

[More Here on Extraction techniques](#) and [More Here on CD-i and DVD](#).

Q25. Can't read certain files from DVD-ROM discs ?

Device reports errors : 05/6F/xx

The DVD standard allows protection on some DVD files ... (*.vob files for instance)

The DVD will not return the data of the blocks where the file-data is stored unless the drive is first told to give the data anyway.

The way to 'tell' the drive to return the data is 'kind of' secret.

Isobuster (at least for now) can not read these files either.

The moment you start your DVD decoding software and start playing a DVD movie, the drive is 'unlocked' by this software

Once 'unlocked' we have to deal with yet another issue ...

Besides 'locked', these sectors are scrambled as well !

Q26. 'Device Reported' Error messages ...

When Isobuster can't access certain data, it will display the error message it got from the drive (after depleting the retry-mechanism).

These error codes can differ depending on the manufacturer, although they all should be conform MMC2.

E.g. : 05/21/00 : 'Logical Block Address out of range'.

E.g. : 03/11/00 : 'Unrecoverable read error'.

[More Here on Error codes](#)

Q27. 'Device reported' Error message when reading from CD Image on HD ??

Isobuster is a multi-layered application, designed that way that functionality can easily be used in other 'Smart Projects' Applications.

At this stage you should think of it as a Front-End (Iso interpretation), a Middle part (Command sequences) and a Basic Engine (CD-ROM access).

(In reality there are a lot more layers (objects, C++)).

When doing File access, another 'Middle Part' is linked in the code that does the actual File access.

However, this 'Middle Part' behaves as if it were a CD-ROM accessing Command sequence. The Front-End 'hardly' knows it is reading from a file instead of a CD.

Hence the term 'Device reported' instead of maybe 'Error while reading from CD-Image File'.

Q28. 'Device Reported' Error message xx/xx/xx ... means ... WHAT ????

As explained in Q26 and Q27, these messages are reported by the CD-ROM/DVD drive.

To know exactly what they mean you should look them up in the command spec for that particular device. Fortunately they have to be conform to MMC(1,2,3).

I'll see if I can't provide some good links to 'free' MMC downloads
Check out this FAQ a bit later.

Q29. Can I edit Image-Files with IsoBuster

Nope, you cannot. The reason is complex as re-creating an image file sometimes is. Reasons are ... If a file changes size, it might very well be that the complete image has to be re-calculated. Depending of the type of image file and depending on the app that's going to be used to write the image-file, EDC and ECC code needs to be changed/added per block. The Iso and File-system might need complete re-doing ... and what about the possible UDF file system then ? Or what about changing one session and pointers to the files from other session ...
And I can think of a few more issues that would occur. Therefore I haven't even started considering editing Image files.

Consider this when you turn to other applications that provide this service :
Suppose you have an image that contains ISO and Joliet but also UDF and all File Systems point to the same files ...

If you edit the image file the ISO and Joliet File Systems are changed.

Under Windows 95 it all seems to work great when you create a CD from the altered image but under Windows 98 it works horrible and you have data corruption and so on That is because Windows 98 defaults to the UDF file system (which remained un-altered) and the references to the files in the UDF file system are now all wrong

Q30. Why are there multiple file-system icons in the window on the left ?

IsoBuster scans for all file-systems it knows.

When it finds such a file-system it adds an icon in the TreeView on the left.

You can pick whichever file-system you like to retrieve the file(s) and directories.

[More Here.](#)

Q31. What do all those icons mean next to files and directories ?

IsoBuster handles a lot (not to say all) exceptions that ISO and Joliet know.

Different from Windows IsoBuster indicates these exceptions to help TroubleShooting.

Should something go wrong with such particular files / directories we (possibly) know where to start looking for the problem.

[More Here.](#)

Q32. I extracted an iso or tao or whatever file from a track, session or complete image using IsoBuster, How do I write this to a CD-R.

Use a Write Application such as CDRWin, Nero, Creator, ...

[More Here.](#)

Q33. I want to re-create a CD (possibly change a few files) but want to safeguard bootability ... Any idea how I can do this ?

[More Here.](#)

Q33. I opened an Image file and don't see all the tracks ?

Correct ! IsoBuster is not able to detect multiple sessions or tracks in image-files. This kind of functionality will get there eventually but not for all image-file types simply because most of them don't

contain this kind of information.

Exceptions are files that are opened with a *.cue file and *.pxi image files which are completely (multi-track, multi-session, CD-Text, ...) supported.

[More Here.](#)

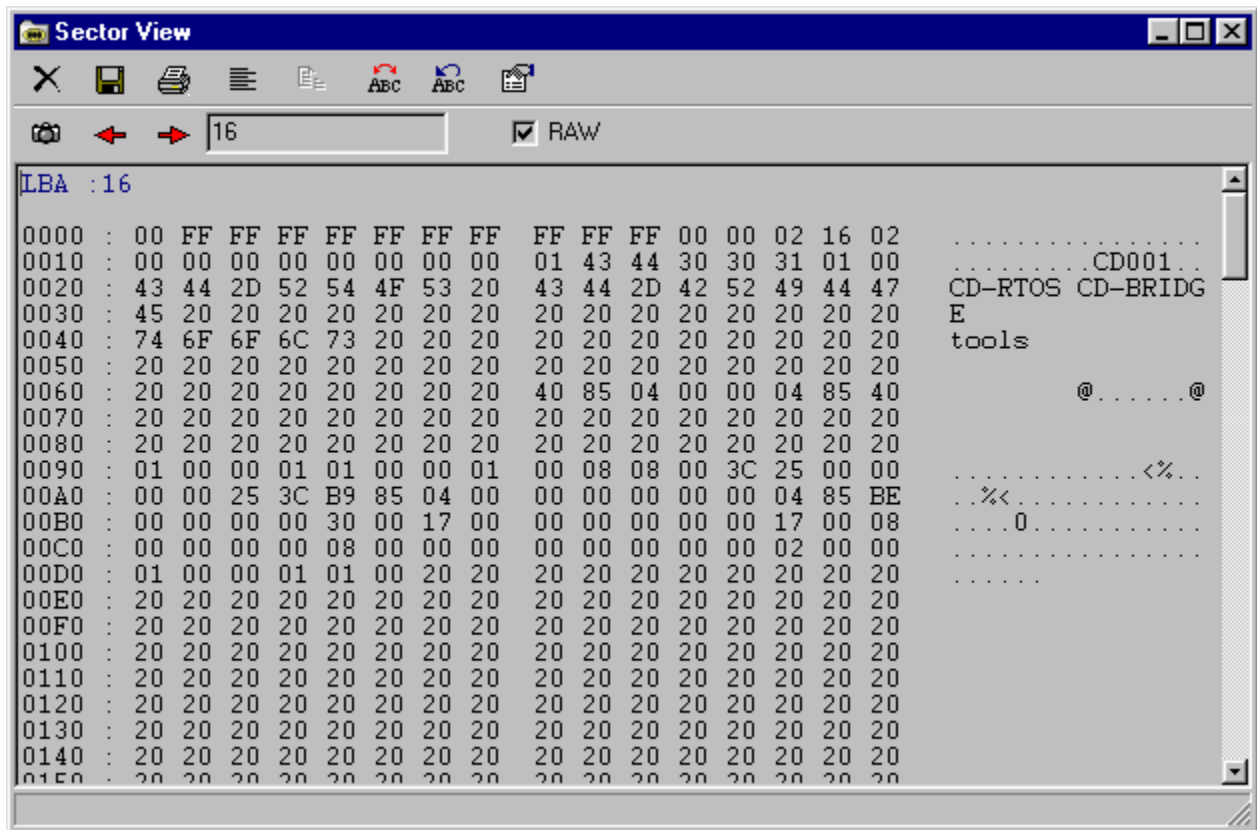
Sector Viewer

IsoBuster comes with a sector viewer.

This tool is more for engineering purposes.


If you're into CD/DVD access and File-Systems stuff then this is a great tool to do analysis.

Several normal edit functions are available as well. Save, Print,



Check if all files are physically readable

This option is available from every [File System](#) icon **except** from the Recovered UDF File System icon because that would only redo what the scan for lost files and directories had already done.

After this scan, IsoBuster will **automatically** create a list of all files that are located in erroneous sectors. As of this moment, files that are located in erroneous sectors will also be 'marked' with a special icon : 

The list with erroneous files can always be recreated without the necessity to redo the scan. Just select the File System icon and create the list via "[Directory tree and file information](#)".

Perform a surface scan

This option is available from every [CD/DVD](#) icon.

After this scan, IsoBuster will inform you of the amount of errors encountered.

Errors on a disc are not necessarily always a problem. They might be located in areas where there is no useful user data.

E.g. sectors that are 'often' unreadable, depending on the media and the way the tracks were written :

- The last two run-out blocks of a session
- The run-out, link and run-in blocks (7 blocks) between every packet (in case of packet writing)

After the scan, in case there are file-systems with files on the disc, files that are located in erroneous sectors will also be 'marked' with a special icon : 

The list with erroneous files can always be recreated without the necessity to redo the scan. Just select the File System icon and create the list via "[Directory tree and file information](#)".

Try to find matching extensions for orphaned (nameless) files

This option is available from the [Recovered UDF File System](#) icon : 



So only available after a "[Find missing UDF Files and Folders](#)" action.

In fact this is done already automatically after the scan action if checked in the [properties](#) (default).

The option provides you the means to search for extensions again or in case the option wasn't checked yet.

Every file **with no extension yet** is opened partly (if not located in an erroneous sector) and IsoBuster dynamically determines the extension (e.g. *.jpg, *.gif, *.bmp, *.wav, *.pdf, ...)

Some extensions are an educated guess, e.g. *.mp3

Some files are built up so that they can be several file types, IsoBuster then adds several extensions which you will have to test, e.g. .xls.doc

Generate a list of files with physical read errors

This option is available from the [Recovered UDF File System](#) icon : 

So only available after a "[Find missing UDF Files and Folders](#)" action.

In fact this is done already automatically after the scan action if checked in the [properties](#) (default).

This option builds up a list of all files in erroneous sectors and is in fact **identical** to the option : [Directory tree and file information / List files with read errors \(in Edit Window\) / Full Path](#)

