RSJ CD-Writer for OS/2

Preface

With RSJ CD-Writer you have purchased a product that is totally different to other existing mastering programs – you will notice that right from the start.

RSJ CD Writer provides an own drive letter for your CD Recorder. With this drive letter you can write files on CD by using common commands (COPY, XCOPY,...) or the workplace shell.

In each chapter you will find many useful tips and examples on how to successfully use this software. We hope that you enjoy working with RSJ CD-Writer.

This documentation offers information on the following subject fields:

Installation	The correct installation of the *RSJ CD Writer File System for OS/2*
Introduction	Step-by-step instructions to basic operations (such as copying files to a CD or creating an audio CD)
File System	Information about the file system tools and operation
CD View	Information about *CD View*, a tool used to copy tracks (both audio and data) from various sources
Reference	Detailed information about the commands, settings and programs
Technical Details	Background information about Writable CDs
Programming	The documentation of the programming interface is now available as a separate document. If necessary, it can be downloaded from our internet page http://www.rsj.de
Help on errors	Information about possible error conditions and how to handle them
System Requirements	Hard- and software requirements for RSJ CD-Writer
Appendix	Additional comments and information

Table of Contents

Installation

In order to install the *RSJ CD Writer File System*, the program *INSTALL* has to be started from the installation disk.

The installation program copies the program files from the disk to the to the desired location on the hard disk and updates the system file CONFIG.SYS.

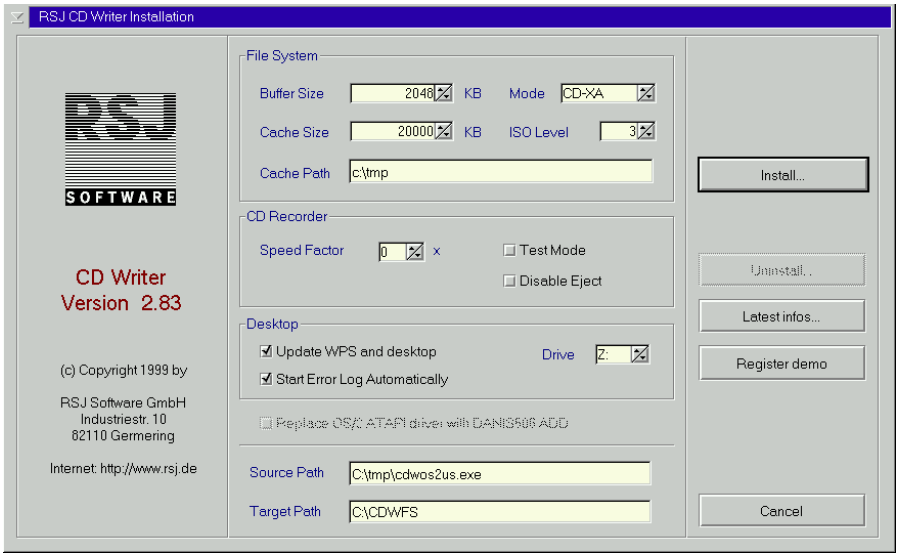
Note: Upon successful installation, the computer must be rebooted.

Starting the Installation

Enter the following command to start the installation program:

```
a:install
```

The installation dialog window appears:



Options in the Installation Program

The options in the installation dialog have following meaning:

Buffer Size

The buffer size determines the amount of main memory to be used as buffer while copying a cache file to the CD recorder. The faster the recorder is, the larger the buffer size should be set. 2048-4096KB should be OK for 2x recorders, whereas 4x recorders should be operated with at least 4096KB.

Cache Size

The cache size is used to specify how large a cache file should become before it will be written to the CD recorder. In case a file to be copied is larger than the size specified here, the cache file will be enlarged automatically; e.g. if a 500MB file is being copied, the cache file will be increased to 500MB, too.

Note: Files as large as this can be copied without temporarily storing them in a cache file by using "CDCOPY"; further information can be found in the reference chapter.

Cache Path

Cache files are stored in this directory. The available free space on this drive should be 4x larger than the cache size in order to be able to create further cache files while the old ones are written.

Mode

This setting allows to select the CD type to be written. The mode specified here is only used with new CDs; CDs, which already contain data tracks, are continued in the mode they have been started with.

Generally, *CD-XA* mode should be used. In case a specific computer system (such as an old unix system with a 1x CDROM drive) refuses to accept CD-XA CDs, this setting can be changed to *CDROM*. Please note that many systems don't recognize multiple sessions on CDs, which have been written in *CDROM* mode, that is, if you plan to write multiple sessions, use *CD-XA* mode.

ISO-Level

The ISO Level controls the way in which the ISO9660 directory is constructed. The following settings are available:

1. All file names are truncated to 8.3
2. File names can be up to 31 characters long but only contain one dot (.)
3. File names can contain up to 31 characters and dots

See the section "Long Filenames" for more information about this topic.

Recording Speed

The number in this entry field determines the recording speed factor, which will be used when writing CDs with the file system (1 = 150KB/s, 2 = 300KB/s, 4 = 600KB/s, ...). If the recording speed factor is set to 0, the default recording speed of the CD Writer will be used (in most cases the fastest speed supported by the CD recorder).

Note: The recording speed can be changed at any time with the CDSPEED command. Refer to the reference section for further information about this command.

Test Mode

This option switches the CD recorder into a so-called Test Mode, which is used to determine whether the data transfer rate from the computer to the CD recorder meets the requirements of a specific recording speed. Most recorders will flash the Write or Busy LED to indicate that no data is actually written.

Some recorders produce error messages when the current session is to be closed in test mode. Therefore, the test mode should only be used to verify the data transfer rate, not the operation of the CD Writer File System. To prevent this error, close the CD with the command "CDATTACH”<DRIVE>-C".

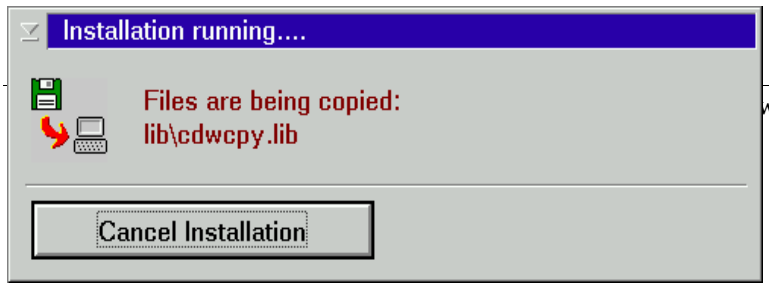
Suppress Eject

Normally, the CD is ejected after detaching. This setting suppresses the automatically ejection.

	Please note that some of the older recorders don't update their internal track directory until the CD is ejected. For that reason, it's a good idea to eject the CD manually *before restarting the computer or turning off the recorder*! Otherwise, the recorder will attempt to write over the previously written tracks, thereby corrupting the information already saved on the CD.
Create Folder	If this option is selected, a folder will be created on the Desktop, which contains the program objects used to work with the *RSJ CD Writer*.
Start Error Log...	This option determines whether the error log utility should be started automatically.
Source Path	Location of the installation files
Target Path	Local drive, where the CD Writer File System should be installed.

Start Installation

Once all options have been set, pressing the „Start Installation" button starts the installation.

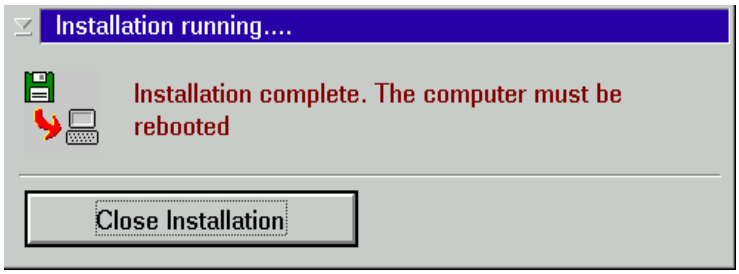


During installation, the installation status is displayed in a progress window. This window can also be used to cancel the installation at any time by pressing the “Cancel Installation” button.

If you have the whole version, please insert your name and the installation key during the installation. The installation key is stacked on the cover of this manual.

If you have the “internet-only-version” you get a key file delivered. Copy this key file in the installation-list.

Once the message *Installation complete* is displayed in the progress window, the installation is complete and the installation program can be closed. The computer must be rebooted after the installation has completed.



Click on “Close Installation” and reboot your system.

Note: Before rebooting the computer, make sure that the CD Recorder is turned on and properly connected.

Changing CD Writer Options

The installation program can be used to change the main settings of the RSJ CD Writer File system after the installation. After changing the settings the computer has to be restarted.

Furthermore, the settings can be changed with the program *CD Writer Control Panel* (in the *RSJ CD Writer* folder on the WPS). Further Information can be found in the chapter *RSJ CD Writer Control Panel*.

Note: In order to install a new version or to repeat a complete installation, please start the installation program from the installation disk.

Introduction

The *RSJ CD Writer* contains the following main components:

- The file system *CDWFS* (used to copy arbitrary files to data CDs)
- *CD View* (used copy CD tracks, such as audio tracks)

Note: *CD View* and the file system should be regarded as two separate products. CDs which have been modified with one component (e.g. formatted) shouldn't be used with the other component.

The following section describes which product should be used for what purpose.

RSJ CD Writer File System

The File system integrates the CD recorder into your system like a hard disk. You are able to use the same programs and commands to copy files on CDs as you are used to when working with a common drive.

Use the File System if you want to

- create data CDs
- write arbitrary files in any directory structure onto CD
- create backups on the CD
- automate the creation of CDs (e.g. via batch files)

In order to create a CD using the file system, perform the following steps:

- attach the CD to a drive letter
- format the CD
- copy the desired files to the CD
- detach the CD

These procedures are explained in detail in the chapter RSJ CD Writer File System.

RSJ CD View

RSJ CD View is used to copy CDs track by track (title by title). CDs organize the data in tracks. Data CDs (CD-ROMs) usually contain one (or more) data tracks, which contain both the directory tree and the file data. Audio CDs, on the other side, contain a separate track for each title.

Note: Further information about the structure of CDs can be found in the chapter *CD View*.

With *CD View*, you are able to simply copy tracks (or complete CDs) via drag and drop.

Use CD View in order to

- copy audio CDs; the separate tracks (titles) can originate from various source CDs and be written onto the CD in any order. You are able to create an individual CD according to your favor.
- copy data CDs; you are able to create a 1:1 copy of any data CD with *CD View* with only a few steps. Please note: Data-CDs should always be copied onto blank CDs.
- *CD View* does not allow to copy single files from data CDs onto a CD. To do this, you'll have to use the file system.

CD View for the Impatient

In order to copy CDs with CD View, the following steps have to be carried out:

Warning: Please read the information about the internal CD structure in the chapter "CD View" before creating or copying complex CDs (e.g. mixed mode CDs)

- Insert a blank CD into your CD recorder
- Start CD View for the target drive (CD recorder); use the object "*CD View - CD recorder*" in the CD Writer folder
- Start CD View for the source drive. Either choose the according object in the CD Writer folder or enter the following command into an OS/2 window:

  ```
  start cdview <cdrom-drive letter>
  ```

  Further information on starting CD View can be found in the chapter *Starting CD View*.
- Verify that the source drive contains a list of tracks (at least one track) while the target drive (CD recorder) contains no tracks.
- *CD View's* status bar (at the bottom of the window) shows information about the number of existing tracks, the MBs used by these tracks, and the CD's free space in minutes and MBs.
- Select all tracks in the source *CD View*
- Drag the tracks into the target *CD View*
- Repeat the previous two steps until all desired tracks (titles) appear in the target *CD-View* in the desired order.
- Verify the target's recording speed; make sure it is not too fast for the source device(s). If you copy audio tracks from a CD-ROM drive, note that most CD-ROMs read audio data with single speed, no matter how fast they can read data.
- Press the record button (the one with the red dot) in the target *CD-View's* tool bar.
- After all tracks have been copied, you must finalize the session. To do so, press the "Finalize" (CD symbol) button in the target CD-View's tool bar.

RSJ CD Writer File System

This chapter describes the use of the RSJ CD Writer File system (CDWFS) by simple examples.

Generally

The file system is started automatically when booted after the installation; therefore, it is not necessary to start an additional program in order to work with the file system.

As the CD recorder receives its own drive letter during the attach operation, the CD recorder can be used like a common drive. In order to simplify the explanation we distributed the drive letters as follows: C: = hard disk, D: = CDROM, Z: = CD recorder.

The following steps are necessary before writing files to a CD:

- attach the CD (assign a drive letter to the CD)
- format the CD

After copying the desired files, the recorder has to be detached from the system. This makes sure that all data from the cache is written to the CD and the CD can be read by a normal CD ROM drive.

Nearly all functions used to control the file system can be executed from the *CD Writer Control Panel* or by using the according command line tools. The following section describes the *CD Writer Control Panel*.

CD Writer Control Panel

In order to change the operating parameters as well as to carry out the most important file system commands, the program *CD Writer Control Panel* (located in the RSJ CD Writer folder on your desktop) can be used.

The program consists of an OS/2 notebook with the following pages:

General Used to specify the base operating parameters *before* attaching the CD (e.g. cache path). Also used to attach and detach CDs.

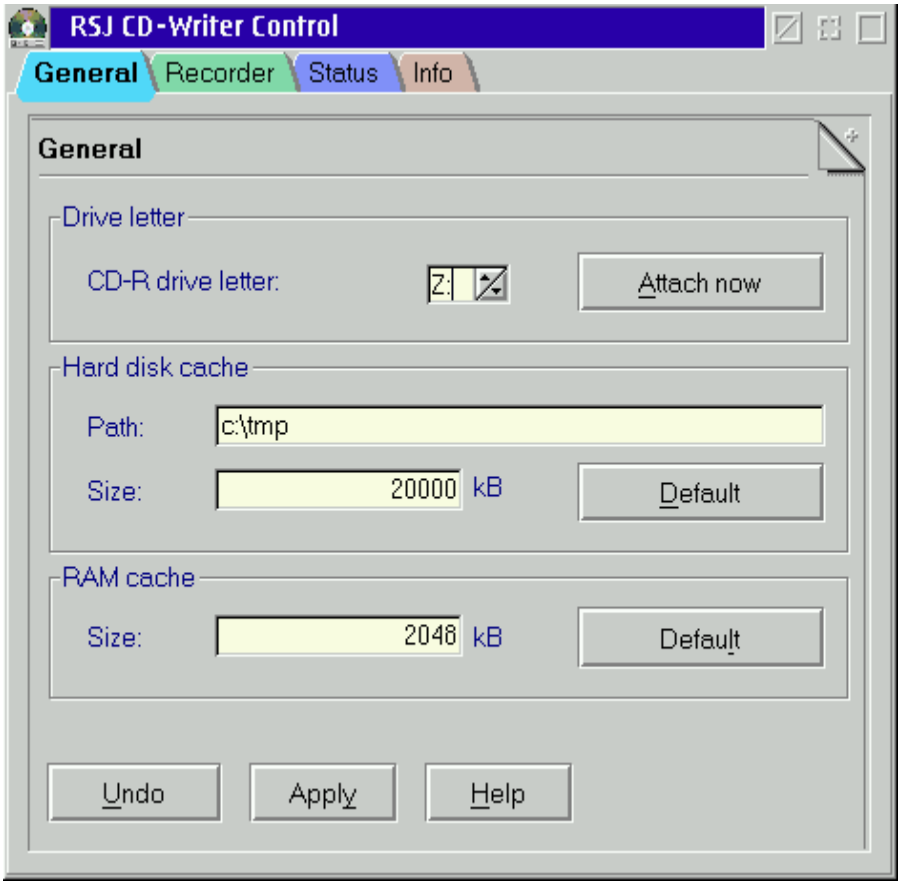
Recorder Allows changing the operating parameters of a currently attached CD (e.g. speed). If no CD is currently attached, the parameters are saved and will take effect the next time a CD is attached.

Status Used to obtain status information about the currently attached CDs (similar to CHKDSK).

Info This page displays copyright and version information.

Note: As usual, the settings become active when the dialog is closed. If you want to activate the new parameters without closing the dialog, press the *Apply* button.

Dialog Page "General"



These options are identical to the options that can be specified in the installation program. Furthermore, this page allows attaching and detaching CDs to drive letters.

Attaching and Detaching CDs

The upper part of the "General" page is used to attach and detach CDs to drive letters. The following section describes the way this is done.

CDR drive letter

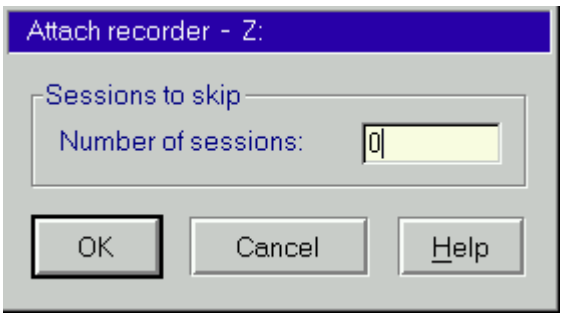
Use this field to select the drive letter, which should be used for subsequent attach/detach operations.

Attach Now

This button appears if the selected drive letter is currently not attached to any file system (that is, the according drive currently doesn't exist). Press this button to attach a CD to the selected drive letter.

A dialog is displayed which allows specifying the number of sessions to be skipped. This can be used to access previous sessions (e.g. if a file has been overwritten or deleted in the current session). Usually, this should be set to "0"

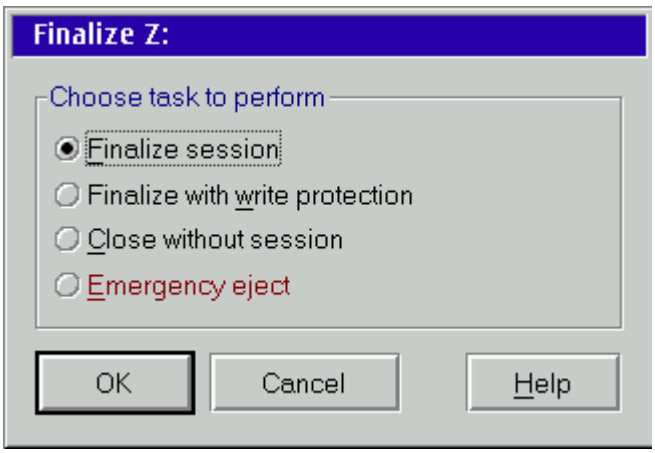
More information about skipping sessions can be found in the description of the "CDATTACH" command (page 30)



Closing the Session

If a CD is attached to the selected drive letter, the button "Attach now" changes its label to "Finalize".

Pressing the button at this time will display a dialog, which asks for the way you want to finalize the CD:



Finalize session	The current session is closed and the new session is prepared for writing. The CD can be read in CDROM drives
Finalize with write protection	The current session is closed as above, yet the new session is not prepared for writing, that is, the CD is logically write protected (sealed) until the CD is unsealed. The CD can be read in CDROM drives
Close without session	The remaining cache data and the directory are written to the CD, yet the current session is not closed. Use this option to temporarily detach a CD without closing the session. The CD can only be read in CD recorders.

Emergency eject	The CD is detached without writing the remaining cache data or the directory tree. This option should only be used to eject a CD, which cannot be ejected with one of the above options (usually in case of hardware errors). The CD is incomplete and all data on the CD will be lost. However, in most cases the CD can still be used to write further sessions.

Select the desired option and confirm with OK.

Modifying the Operating Parameters

The lower part of the "General" page is used to modify the basic operating parameters (such as the cache path). Options changed here will take effect the next time a CD is attached; all currently attached drives will continue to use the old parameters.

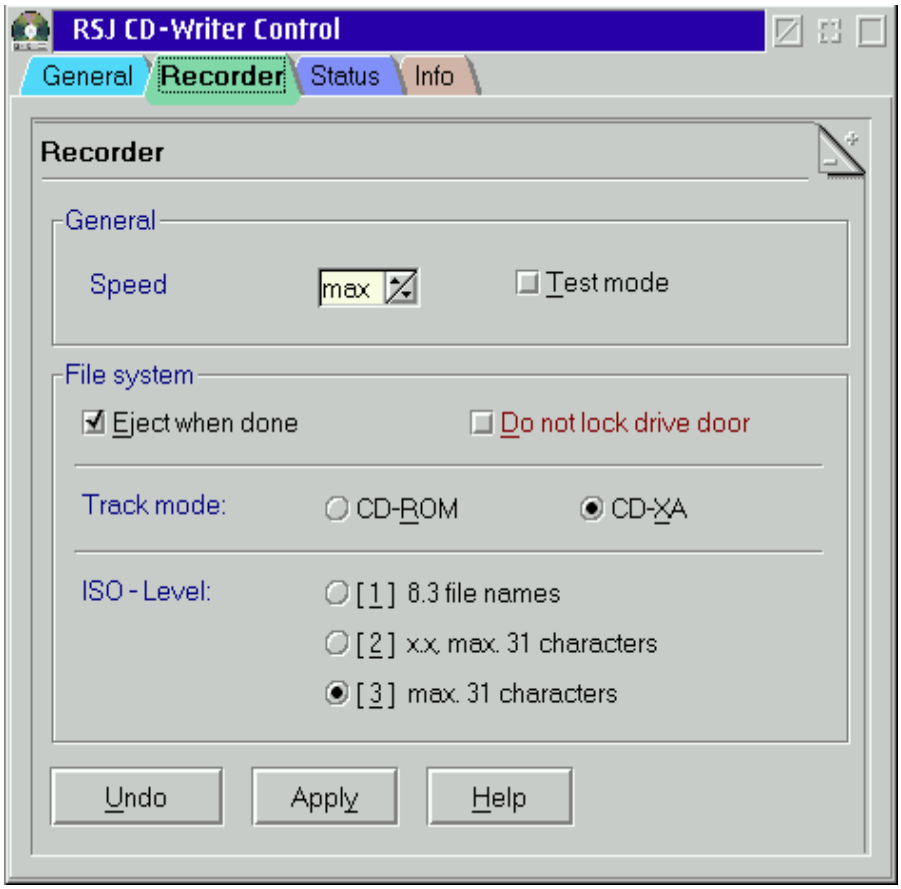
Hard Disk Cache

Allows changing the cache parameters. Further details about these parameters can be found in the description of the installation program. Please note that the cache path should point to a local drive.

RAM Cache

This field specifies the size of the copy buffer in main memory which is used when copying a cache file to the CD recorder. Further information about this parameter can be found in the description of the installation program.

Dialog Page "Recorder"

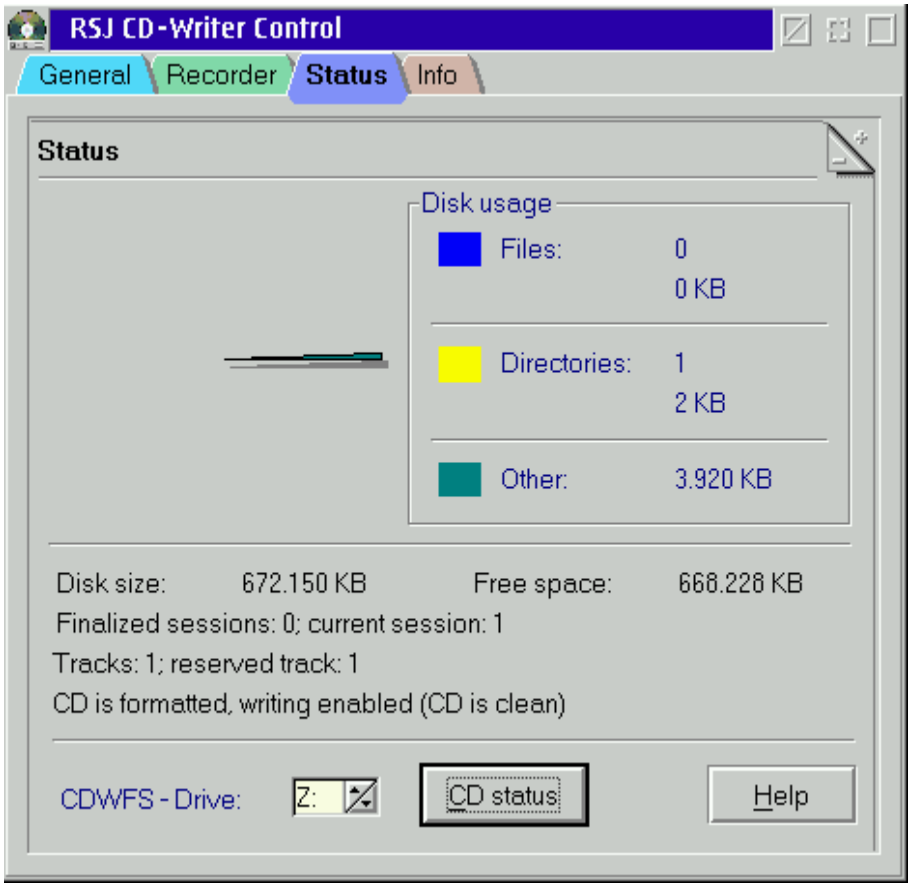


This page can be used to modify the operating parameters of all currently attached CDs as well as the default parameters to be used by subsequent attach operations.

Further information about these parameters can be found in the description of the installation program.

Note: The "Test Mode" should only be changed if nothing has been written to the CD since it has been attached. Otherwise, the contents of the CD might get corrupted; some recorders may even damage the internal CD information structures, making it unusable for subsequent write operations. If in doubt, detach the CD before changing these options.

Dialog Page "Status"



Use this page to obtain information about currently attached CDs. The drive letter spin button allows selecting all drive letters, which are attached to the *RSJ CD Writer File System*. If no CD is currently attached, this field (and the "CD Status" button) will be disabled.

The information displayed is similar to the CHKDSK output and contains the number of files and directories as well as the used and available disk space on the CD.

Dialog Page "Info"

This page displays information about the product version as well as copyright information.

Drive object

You can choose the following option from the driver's context menu:

- Unseal
- Erase (CD RW)
- Finalize session

Operation

This section serves as a tutorial to the operation of the *CD Writer File System*. Detailed information about each command can be found in the reference section.

Warning: Most CD Recorders are sensitive to power failures, interruptions during write operations, forcibly ejecting the CD (e.g. by switching off the CD Recorder) and similar procedures.

If you want to eject a CD without saving the information previously written to it, use the command "cdattach <drive> -no_flush" (or the option *Emergency Eject* in the *Control Panel*) to unlock the drive tray. Otherwise, information on the CD might be lost or the CD might be unusable for further write operations.

Command Line Operation

This section serves as a tutorial to the operation of the file system from the OS/2 command line.

Attaching the CD

In order to associate a drive letter to the CD Recorder, enter the following command

```
cdattach <drive>
```

Example:

```
cdattach z:
```

Note: The drive tray will be locked while the recorder is attached to a drive letter, that is, the CD cannot be ejected until the recorder has been detached as shown below.

This example assigns the drive letter Z: to the CD recorder. Enter the following command to see what's on the CD:

```
dir z:
```

If there are no files on the CD and the label is UNFORMATTED, the CD is not formatted and must be formatted with the OS/2 command FORMAT.

Formatting the CD

Formatting a CD is actually done by reserving a track with a specific length. The existence of this track is used to determine whether the CD is considered writable or not.

Enter the following command to format the currently inserted CD:

```
format <drive>
```

Example:

```
format z:
```

Now the CD is formatted. This can be verified by typing the following command:

```
dir z:
```


The root directory ("." and "..") has been created; furthermore, the available space on the CD (about 600MB, depending on the CD) is displayed below the root directory.

Writing to the CD

Any OS/2 command can be used to write to the CD.

Examples:

```
copy c:\config.sys z:\config.sys
xcopy c:\* z: /s
...
```

Theoretically, you could even install applications on the CD and work directly from the CD. However, since each track on the CD can be written only once, the CD would be filled by temporary files and repeatedly saving the same file while the amount of data on the CD would remain basically constant.

Note: In order to maintain compatibility with other operating systems, extended attributes are not supported. Extended attributes are automatically discarded.

Getting Information about the CD

The OS/2 command CHKDSK can be used to get detailed information about the CD..

Example:

```
chkdsk z:
```

In addition to the well-known CHKDSK information, some CD-specific information is displayed at the end of the information output. This includes the number of tracks already written (max. 99), the number of sessions and the current status of the CD.

The additional parameter /V tells CHKDSK to provide additional information about the creator of the CD, the software used to write the CD and further information defined by the ISO9660 standard.

Example:

```
[C:\]chkdsk z:

The type of file system for the disk is CDWFS.
The CDWFS file system program has been started.

RSJ CD-WO File System Version 2.50 - (c) 1997 by RSJ Software GmbH Germering

   644.868 kilobytes total disk space
         2 kilobytes are in 0 directories
    10.810 kilobytes are in 2 user files
         0 kilobytes are in extended attributes
         0 kilobytes are reserved for system usage
   435.364 kilobytes available for use

CD-Writer specific information:
         7 finalized sessions; open session: 8
        28 tracks; reserved track: 28
        => CD is formatted, writing enabled (CD is clean)
```

This example shows the output generated by a partially written CD. The CD contains 7 sessions and 28 tracks.

Detaching the CD

Before the CD can be ejected, it must first be detached from the associated drive letter. This can be done with one of the following commands:

```
cdattach <drive> -no_flush
cdattach <drive> -c
cdattach <drive> -s
cdattach <drive> -x
```

Example:

```
cdattach z: -c
```

This example causes all unsaved information to be written to the CD. Afterwards, the drive tray is unlocked and the CD can be ejected.

Note: Some drives keep track information in their cache until the CD is ejected. As a result, the CD is ejected automatically if the CD has been modified since it has been attached.

The various detach options have the following meaning:

-no_flush The drive tray is unlocked without writing any cached information to the CD. This option is used primarily to eject a damaged CD which can't be detached with one of the remaining detach options.

-c The cached information, if any, is written to the CD and the drive tray is unlocked. As yet, the information on the CD can only be used together with the *CD Writer File System*; in order to use the CD with CDROM drives, the following detach option must be used.

-s Same as -c; however, the current session will be closed as well. This allows reading the CD in standard CDROM drives. Closing a session takes about 12 – 20 MB disk space, so this option should be used only if the CD is to be read by CDROM drives.

-x Like -s but, the CD will be "sealed", that is, the CD becomes write protected. The write protection can be removed at any time by using the command "format <Drive> /UNSEAL".

Note: Old CDROM drives can only access the first session on a CD. If you plan to read the CD in old CDROM drives, make sure you close the current session after all required data has been copied to the CD. You can, however, close the CD at any time (e.g. to interrupt the copy operation temporarily) with the detach option -c.

Accessing a Previous Session

The command CDATTACH has an additional option to skip one or more sessions when the CD is attached to a drive letter. This option allows accessing files, which have been deleted or modified in the currently active session.

Note: If the CD has been created by the CD Writer File System, this option can also be used to skip write operations which have been completed with the detach option -c. CDs created by another mastering software (e.g. Photo CDs) allow skipping physical sessions, only.

Example:

```
cdattach z: -l1
```

This example skips one session; thus, a file, which has been deleted or modified in the current session, is now again available in its original status.

If more than one session is to be skipped, increase the number behind the option -l:

```
cdattach z: -l3
```

This example skips 3 sessions at once.

Long Filenames

The long filename support of the *RSJ CD Writer File System* is based on three different standards:

Rock Ridge Extensions

This standard is used by most Unix systems to save long filenames along with their Posix file attributes. We're currently supporting about 140 characters for long filenames. The Posix file attributes are always set to default values.

Please note that Unix file systems are case sensitive while OS/2 is not. If the RSJ CD Writer File System is used to read Unix CDs, it's possible that a specific file cannot be opened if there's another file in the same directory which differs only in case.

This standard is also used as the base standard for CDs. As long as a CD contains Rock Ridge information, it's preferred to "Joliet" because Joliet limits the length of a single filename to 64 characters.

Joliet

This standard is mainly used in the Windows environment. However, it supports only 64 characters per filename, so it's usually not used to read existing CDs as long as they contain Rock Ridge information.

ISO9660

Selecting ISO Level 2 or 3 will allow filenames up to 31 characters with the following limitations:

- All characters are upper-case
- National language characters are replaced by a tilde (~)
- Long filenames will be truncated to 31 characters

If the CDs are intended to be used on DOS systems, the ISO level should be set to "1". Optionally, you can also make sure that no file violates the DOS 8.3 convention, that is, as long as all files are 8.3, the ISO level won't change the contents of the ISO directory tree.

Using Long Filenames

When a CD is detached, the complete ISO9660, Joliet and Rock Ridge directories will always be written to the CD. Each time a CD is attached, the standard providing the longest filenames will be used to read the directories.

All known operating systems behave similar, that is, they will always use the directory tree, which preserves as much information about the filenames as possible.

Unfortunately, the OS/2 CD file system supports neither Rock Ridge nor Joliet. Of course, you can always use the RSJ CD Writer File System to read back CDs containing Rock Ridge or Joliet filenames.

Note: A Joliet-capable update for CDFS.IFS (the file system OS/2 uses to read CD-ROMs) is available on the IBM OS/2 Device Driver page in the Internet.

CD-View

The PM application CD-View is used to deal with the tracks on a CD. It can be used to copy audio tracks to (or from) CDs in arbitrary order. Furthermore, CD-View can also be used to copy data CDs much like DISKCOPY is copying diskettes.

CD-View should be considered a separate product and needs exclusive access to all devices it is dealing with. Therefore, any currently active drive letter assignment must be deactivated (e.g. by calling "CDATTACH -C") before accessing the CD recorder with CD-View.

Note: Working with tracks requires fundamental knowledge about the make-up of music and data CDs. To prevent mistakes or data loss, the following section should be read in any case.

Basics

Please read this section carefully before using CD-View.

Tracks, Table of Contents and Sessions

Each (non-blank) CD contains between 1 and 99 tracks.

Each track can save a single data format. Audio tracks can only save digital audio data, while data tracks can only store data.

The Table of Contents (TOC) of a CD solely contains information about the number of tracks, their starting position on the CD and the basic track type (audio or data). CD-View uses this information to display the track directory, thus cannot display any information about the contents of the according track.

CDROM drives don’t return detailed information about all sessions on the CD. For that reason, CD-View is not suitable for copying multisession CDs.

Data CDs (CDROM)

- Data CDs usually contain only a single data track. Exception: Photo-CDs as well as CDs written by the RSJ CD Writer File System.
- The directory of the files on the CD is located at a certain position in the data track.
- Data tracks must always start at the same address that means the track order of a Data CD must be maintained when being copied to another CD. Furthermore, the target CD must be empty to make sure the first track will start at address 0.
- Additionally CD-View can copy multisession CDs. The number of sessions can be determined by running CHKDSK after attaching the CD to a drive letter with CDATTACH.
- Most Data CDs contain copyrighted material, which may only be copied for private backup purposes.

Audio CDs

- Audio CDs contain one or more music titles, each of which is stored in a separate audio track.
- Some – especially old ones - CDROM drives are not able to read audio tracks. Please note that reading audio tracks is different from playing audio tracks (which is supported by most CDROM drives).
- OS/2 does not offer a dedicated interface for reading audio tracks. Although some CDROM drives are explicitly supported by OS2CDROM.DMD or additional filter device drivers (???.FLT), don't expect to be able to read audio tracks with a specific CDROM drive.
- Audio tracks must be read contiguously. If the audio data can't be processed fast enough, the resulting track might contain cracks or repetitions. In most cases, however, these errors will be beyond the capabilities of a human ear.
- All audio tracks must be located in the first session of the CD. Audio CDs are always single-session CDs, no matter whether the playback device is a multisession capable CDROM drive or not.
- Copyright law protects music titles. Digital copies of audio tracks are only allowed for private use.

Starting CD-View

CD-View is started together with the desired device path name. This path name either points to a CDROM drive letter, a directory on a hard disk or the name of a CD recorder.

The installation program automatically creates program objects for each of the following devices:

- CD recorder
- hard disk (in a subdirectory of the installation path named "Tracks")
- all available CDROM drives

In order to support additional devices, either start CD-View manually or copy one of the existing program objects and edit the device name in the parameter field.

CDROM

In order to start CD-View on a CDROM drive, specify the drive letter of the CDROM drive.

Example:

```
cdview d:
```

This example starts CD-View and displays the track directory of the CDROM drive D:.

Hard Disk (Temporary Cache)

If there's no CDROM drive available (or the CDROM drive does not support reading audio tracks), CD-View supports using a subdirectory on a local hard disk as a temporary cache. This is done by emulating a CD recorder, which saves each track in a file called TRACKxx.TRK or TRACKxx.WAV (xx represents the track number from 01 to 99).

Notes: The subdirectory should only be modified by CD-View. If one of the track files is deleted manually, all following track files must be re-named accordingly.

You can drop WAV files onto a writable CD-View session (recorder or hard disk) from a WPS folder. When doing so, please observe that the files you drop have the following format:

Stereo, 16 bit, 44 kHz sampling rate.

This is a 'standard' WAV format (CD quality).

The emulation driver saves the track information in the extended attributes of the track file. For that reason, the target directory must point to a drive, which supports extended attributes.

Data tracks are saved with the extension .TRK, while audio tracks are saved with the extension .WAV. Playing audio tracks is supported if the system has a sound card, which is able to play audio files with 44.1KHz, 16 Bit stereo.

Example:

```
cdview c:\cdwfs\tracks
```

This example emulates a CD recorder in the directory c:\cdwfs\tracks. The tracks will be saved in files named TRACKxx.TRK or TRACKxx.WAV, respectively.

CD Recorder

In order to run CD-View with a CD recorder, use the device name "CDR:". If multiple CD recorders are attached to the system, the SCSI ID of the desired recorder can be appended after the colon at the end of the device name in the format "a.i". a represents the adapter index (0 = first adapter, 1 = second adapter, ...) while i selects the SCSI ID of the CD recorder.

Notes: Due to a limitation in the device driver RSJSCSI.SYS, only one recorder can be used at the same time. This limitation is subject to change in a future version.

If the CD recorder identifies itself with an unknown device name, the environment variable CDR_DEVICE_NAMEx can be used to add a new device name to the list of already supported devices. The x represents the device group; further information about supporting unknown CD recorders can be found in the description of the CDWFS.IFS command. Please note that the device name must be specified without quotation marks.

Examples:


```
cdview cdr:
```

This example starts CD-View for the first supported CD recorder.

```
set CDR_DEVICE_NAME1=YAMAHA  CDR102
cdview cdr:0.4
```

This example tells CD-View to address the recorder with the SCSI ID 4 on the first adapter. Additionally, the device name of the Yamaha CDR102 recorder is added to device group 1 (which includes all Philips and Yamaha recorders).

CD-View Interface

CD-View is a Presentation Manager application, which behaves much like the well-known Workplace Shell. It has three main areas: a toolbar at the top, the track directory and a status bar at the bottom.

To change the background color or the font of the track directory, just drag a color or font from the according palette into the track directory.

Color, font and position information are saved in an .INI file named cdview.ini in the installation directory. The information is saved on a per-device base, that is, each device has a separate entry in the .INI file.

CD-View can be closed by double-clicking the system menu or by selecting Close in the system menu.

Toolbar

The toolbar resembles the controls of a CD player or video recorder and is used to operate CD-View. Like a CD player, the toolbar contains controls to start or stop audio playback, eject the CD, ...

The following graphic explains all available controls:

Start audio playback Plays the currently cursed audio track. If the drive's lineout jack is connected to a sound card, the volume can be controlled by the sound card mixer; otherwise, a headphone or amplifier should be connected to the CD drive.

Pause audio playback Stops all currently active audio playback operation. As long as no other playback operation has been started be the Play button and the CD has not been replaced or used for copying, the playback operation can be resumed by pressing this button again.

Record After one or more tracks have been prepared for copying via Drag & Drop, this button is used to start the copy process.

Finalize current sess. Once all tracks have been copied to the CD, the current session can be finalized by pressing this button. Please read the chapter Finalize Session before finalizing a session.

Eject This button causes the currently inserted medium to be ejected.

Note: In some cases it can happen that according to the recorder and track type (data or audio track) after reinserting of the CD not all of the tracks can be recognized. During the write process of the new track the old track get headed. Consequently the whole medium is destroyed. In case of this problem finalize the current session before the CD is ejected and look after repair of the CD-recorder.

Recording speed This control is used to adjust the recording speed of the CD recorder in multiples of 150KB/s. The available speed factors depend on the capabilities of the CD recorder. Adjust the recording speed before pressing the Record or Finalize button. Please read the chapter Recording Speed carefully before adjusting the speed factor.

Erase Track This button can be used to cancel all chosen tracks. According on whether the tracks are stored on a hard disk, already CD-R/Ws can be erased afterwards.

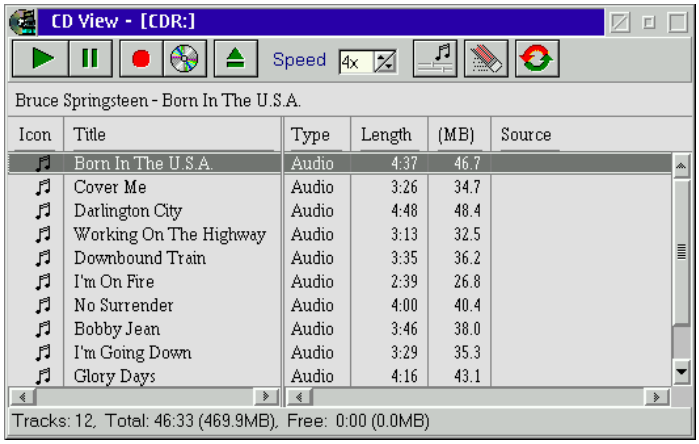
Rescan track directory This button forces a rescan of the track directory (e.g. after a new medium has been inserted). All tracks prepared for copying will be discarded if this button is pressed.

The controls in the toolbar are enabled or disabled according to the capabilities of the target device (CDROM, CD recorder or hard disk). For example, a hard disk cannot be ejected, while a CDROM drive cannot be used to write tracks.

Furthermore, the currently cursed track will exert influence on the status of some controls. For example, it is not possible to play a data track.

Note: Clicking the track directory with the right mouse button brings up a popup menu which includes most of the controls of the button bar.

Track Directory



The track directory lists all tracks on the current CD. Additionally to the track name, the directory contains the track type (Audio, CDROM or CD-XA) as well as the length of the track in minutes and megabytes.

The area right above the track directory contains the CD label. If the CD is unknown, the CD will be labeled Unknown CD (if there's at least one track) or the track title area is displayed as a narrow, empty row.

The first column contains a musical note for audio tracks or a diskette symbol for data tracks. This icon has an additional purpose: if a track has been prepared for copying, the icon will be displayed as a halftone bitmap. Once the track has been copied successfully, the icon is displayed with full contrast.

To change a track title or the CD label, hold the Alt key while clicking the track title with the left mouse button. The track titles and the CD label are saved in the .INI file cdwfs.ini under a key, which is generated from the length of all tracks on the CD.

In order to copy tracks from a source window to a target window, select one or more tracks in the source window, grab the tracks with the right mouse button and drag them to the target window. If some of the tracks have been dragged accidentally, they can be removed from the track directory by dragging them to the Shredder of the OS/2 Workplace Shell as long as they have not been written to the CD.

Note: The driver for hard disk directories permits deleting tracks even if they have already been copied. This allows using the hard disk as a temporary track cache.

Status Bar

The status bar displays information about the currently inserted CD as well as the status of CD-View.

Usually, the status bar contains information about the number of tracks on the CD, the disk space used by these tracks and the free disk space left for new tracks.

Note: The calculation of the remaining disk space needs to make assumptions about the tracks, which will be copied, to the CD. Therefore, it may by inaccurate especially if many audio tracks are to be copied to a hard disk directory. Please read the chapter Track Size and Disk Space for further information.

CD Labels

As mentioned in the chapter Track Directory, each track can be given a name. Furthermore, the disk label can be changed in the title area of the track directory. This is done by holding down the Alt key while clicking the title to be changed with the left mouse button.

The track titles and the CD label are saved in the .INI file cdwfs.ini under a key, which is generated from the length of all tracks on the CD. Thus, two CDs with exactly the same track layout will be treated equal, no matter whether the track contents are different or not. However, it is unlikely to have two CDs with the same track layout and different track contents.

Each time a copy operation has completed, the track directory is saved in the .INI file under a new CD key. The old track directory, however, is not deleted from the .INI file since another CD might still be using it. Thus, it's recommended to copy as many tracks as possible in a single copy operation to prevent the .INI file from growing unnecessarily.

Note: Unmodified track titles will not be saved in the .INI file. For that reason, the .INI file won't become any bigger if the original track titles (such as Track 01, Track 02, ...) are not changed.

Copying Tracks

Before any tracks can be copied, CD-View must be started for both the source and the target drive.

Note: If you want to copy self made WAV files onto CD, please observe the note in the *Hard Disk (temporary storage)* section above.

First of all, the desired tracks must be selected in the source window. Once selected, the tracks are prepared for copying by dragging them with the right mouse button to the target window. The tracks will show up in the target directory with a halftone icon, indicating that they are not yet copied but prepared for copying. Please note that the Source column will always show the complete source path of the track in case you get confused after reordering the tracks a couple of times.

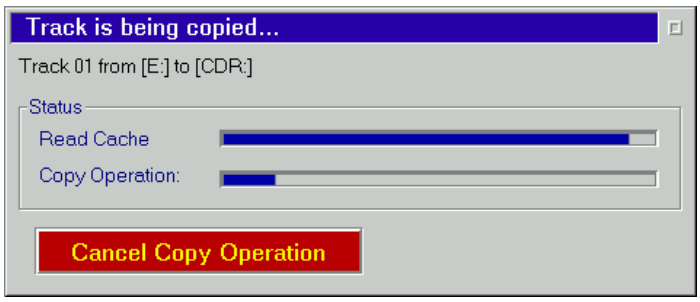
Note: The tracks to be copied are inserted right before the track the mouse pointer had been pointing at when the right mouse button was released. Since it is not possible to change the order of the tracks, which have already been copied, to the CD, new tracks must be dropped either onto a track, which has not yet been copied, or the empty area below the track directory.

The order of the new tracks can be changed at will by picking up some tracks once again and dropping them at another location.

Before the copy operation is started, the recording speed can be adjusted in the toolbar. Depending on the speed of the source drive and the quality of the writable CDs, a higher or lower speed might be necessary. Further information about determining the optimum recording speed can be found in the chapter Recording Speed.

Pressing the Record button in the toolbar starts the copy operation. A new window appears which displays the copy progress:

The status window contains two progress indicators which display the number of buffers in the read cache as well as the progress of the copy



operation.

The read cache is used to compensate short delays in read commands and/or to maintain a minimum transfer rate when reading audio tracks. Depending on the track being copied and the source and target drives, the read cache should have the following status:

Track type	Source	Target	Read cache full	Read cache empty
Data	All	CD	Minimum recording speed is main-tained.	Copy operation might have to be aborted.
Data	All	HD	unimportant	unimportant
Audio	HD	CD	Minimum recording speed is main-tained.	Copy operation might have to be aborted.
Audio	CD	HD	Hard disk cannot maintain minimum read speed for audio tracks. The audio file is possibly damaged.	Minimum read speed is main-tained.
Audio	CD	CD	The target might not be able to maintain the	The source might not be able to maintain the

Track type	Source	Target	Read cache full	Read cache empty
			minimum speed for reading audio tracks.	minimum recording speed.

As this table shows, copying audio tracks from a CD to a CD recorder cannot guarantee successful completion: the source and the target drive must use exactly the same speed to maintain both the minimum read speed for reading audio tracks as well as the minimum recording speed for writing to a CD recorder. If the recording speed is lower than the read speed, the copy operation does not necessarily have to be aborted, but the resulting audio track might contain cracks or repetitions due to the lack of positioning information in audio tracks.

Modern CDROM drivers, however, contain a pattern-matching algorithm, which compares the last few blocks of audio samples in the CDROM cache with the samples currently read by the drive head to find the position where the last read operation has been stopped. This allows reading audio tracks without the risk of cracks or repetitions in the audio data.

Note: Most CD recorders have an additional cache buffer, which is sometimes bigger than the read cache used by CD-View. In this case, the read cache will run empty at the moment the write operation begins and, depending on the speed of the source drive, will fill up slowly or remain empty. This does not indicate an error as long as the copy operation is not aborted.

The copy operation can be cancelled at any time by pressing the red button labeled *Cancel Copy Operation*. Please note that a partially written track will be useless in most cases.

Finalize Session

Once all tracks have been copied, the current session must be finalized to write the Table of Contents to the CD. The TOC is used by CDROM drives and audio CD players to access the track directory; CD recorders don't need it because they save a copy of the track information in a special area, which can only be accessed by CD recorders.

It might be useful to increase the recording speed to the maximum before finalizing the current session as long as the resulting speed is supported by the medium.

The current session can be finalized by pressing the Finalize button in the toolbar. This will take a couple of minutes, depending on the previously selected speed factor.

Recording Speed

When writing CDs with the *RSJ CD Writer File System*, the recording speed can easily be adjusted afterwards in case of problems without destroying the CD. This is possible because the file system knows the internal structure of the CD according to ISO9660 and can write the files into a new track after the speed has been adjusted.

CD-View, however, has been designed to copy audio and data tracks without any knowledge of the internal track structure. If a copy operation has to be aborted due to insufficient read performance, the resulting CD will be useless and will have to be discarded; a new CD has to be written from scratch.

In order to determine the optimum recording speed, please pay attention to the following points:

- If the source is not able to read the data with the selected recording speed, the copy operation will have to be aborted.
- CD-View tries to measure the read performance while the read cache is being filled. This might result in error messages when copying from a CDROM to a CD recorder if the read performance is just below the selected recording speed. Sometimes, a second try might be necessary to copy the track if the source drive is reading exactly with the same speed as the target drive is writing.
- Since it is not possible to address the very same position in an audio track twice, audio tracks must be read contiguously. Copying an audio track directly from a CDROM to a CD recorder might lead to cracks and/or repetitions in the resulting audio track if the source drive is reading faster than the selected recording speed. Modern CDROM drivers, however, will take care of this problem and prevent cracks and/or repetitions in most cases.

- The speed of CDROM drives can't be adjusted under OS/2. Moreover, most CD recorders and CDROM drives don't read audio tracks with the same speed as data tracks. For that reason, it might be necessary to experiment with the recording speed if it is desired to copy directly from a CDROM drive to a CD recorder. Since inadequate read performance will be detected before the track is actually written, it is recommended to start with the highest available recording speed until the copy operation succeeds. Please note that, depending on the size of the read cache in the CDROM drive, the performance test might pass while the read performance is still way below the requirements. To clear the read cache, eject and reinsert the CD before starting the copy operation with a new recording speed.
- If possible, the read performance of a CD recorder is set to the maximum allowed value.
- If a CD recorder is using an unknown device name the recording speed cannot be changed.

Track Size and Disk Space

The track size is specified in two different units:

- Playback length of the track (in minutes)
- Size of the track (in megabytes)

Concerning Audio-CDs playback will always occur at 75 sectors per second. As the sector size in audio tracks (2352 bytes) is larger than in data tracks (2048 bytes), an audio track consumes more disk space on a hard disk than a data track with the same playback length. Please note that one minute audio is about 10MB space.

The free space reported in the status line assumes a sector size of 2048 bytes. Therefore, it is possible that a specific audio track does not fit on the hard disk although the indicated free space should be sufficient.

Pregaps

Each track starts with a so-called Pregap. This area shows up on audio CDs as a 2 second pause between two music titles; yet it's present on data CDs as well. If the track type changes between two tracks, another second will add to the Pregap which sums up to a total length of 3 seconds. CD-View subtracts the length of the Pregap automatically, that is, the reported track length may differ from the length indicated on the CD cover. The total length reported in the status line, however, includes the Pregaps between the tracks.

The contents of the Pregaps are not copied by default since the contents are unreadable, anyway. This may lead to a 2 second pause between the music titles of live recordings.

The reported track lengths are rounded downwards, thus adding all track lengths together does not necessarily yield the same result as reported in the status line. This is also true when new tracks are added to the CD: the remaining free space might be reduced by another second in addition to the 2 or 3 seconds used by the Pregap.

Reference

This section describes all files and commands used to work with the RSJ CD Writer File System:

Commands for CONFIG.SYS

The following commands must be specified in the system file CONFIG.SYS. Please note that the computer must be rebooted before any changes can take effect.

RSJSCSI.SYS

The device driver RSJSCSI.SYS provides simplified access to SCSI devices. The CD Writer File System uses this device driver to access the CD Recorder.

Syntax:

```
device=<path>\rsjscsi.sys [-q] [-n<driver name>] [-x]
```

where <Path> is to be replaced by the installation path.

The optional parameter has the following meaning:

-q While booting, ask user for confirmation before installing the device driver.

Note: This driver is needed even if you use an IDE/ATAPI recorder.

CDWFS.IFS

The file system CDWFS.IFS only provides the background process CDWFSD.EXE with commands contrary to earlier versions. The complete configuration data are registered in “RUN=…\CDWFS.IFS in the CONFIG.SYS.

Following options for CDWFS.IFS are available:

-q Request confirmation

-d All accesses to the file system are protocolled at the serial interface COM2. This option is used to test the file system: In case of errors, a terminal with 9600 baud can be connected to the serial interface in order to find out what's going wrong.

LOCKCDR.FLT

Some CD recorders claim to be CDROM drives. As OS2CDROM.DMD allocates all CDROM drives at bootup, those recorders cannot be accessed by additional software, including the RSJ CD Writer File System. To correct this behavior, the filter device driver LOCKCDR.FLT is added to the file CONFIG.SYS; all already known CD recorders will be converted to WORM devices automatically. LOCKCDR.FLT supports ATAPI, too.

In order to add an unknown CD recorder to the built-in list, the parameter -i:"Recorder Name" can be used to specify the device name of the unknown CD recorder.

Example:

```
basedev=lockcdr.flt -i:"ims     CDD2000"
```

In this example, the Philips recorder CDR2000 is added to the built-in list of CD recorders. During bootup, the OS/2-internal device tables are modified such that the CD recorder is treated as a WORM device instead of a CDROM.

The name of all connected CDROM devices as well as whether they have been converted to WORM devices is printed to the screen while the system is booting.

Note: It is not necessary to specify the complete device name. In the example above, specifying -i:"IMS" would do the same job. However, the more complete the device names are specified, the less likely it is that a CDROM drive is converted to a WORM device accidentally.

CD Writer Daemon

The *CD Writer Daemon* is running as a background process and receives its commands from the file system *CDWFS.IFS*. Usually, it's started with a *RUN=*... statement in *CONFIG.SYS*, however, it can also be started manually from an OS/2 command line.

If the *CD Writer Daemon* is not running, all attempts to attach a CD to a drive letter will be cancelled with a "Drive not ready" error.

The *CD Writer Daemon* accepts the following command line parameters:

-p <path> Cache path. The specified path is used to save the cache files while data is being written to the CD. It should point to a fast hard disk, which is used as little as possible. A separate partition, however, decreases the performance because the drive head must jump between the partitions instead of staying in the same partition.

-c <KB> Recommended size of the cache files in KB. Since files written to the CD will never be spread across multiple cache files, the size specified here could be exceeded by as much as the largest file to be written to the CD.

Default: 20000 (about 20MB)

Note: Since multiple cache files are read and written simultaneously, the specified hard disk should have at least 4 times the space specified here. Thus, when using the default value "20000", the hard disk should have about 80MB free space.

-b <KB> Size of the RAM buffer, which is used to write a cache file to the CD.

Default: 2048KB

-t <mode> Track mode for new CDs. 1 = CDROM, 2 = CD-XA. If a CD has already been written to, the mode of the last data track on the CD will override the mode specified here.

Default: 2 (CD-XA)

Note: If CDROM tracks are used to create CDs, it's likely to have problems when reading multiple sessions from a standard CDROM drive. For that reason, it's recommended to use CD-XA unless the CD will contain only a single session.

-i <level> ISO level used to write the ISO9660 directory information.

The following levels are available:

1: 8.3 filenames (same as DOS)

2: max. 31 characters, yet only a single dot (.)

3: max. 31 characters

Default: 3

Note: Level 3 is not complying with an ISO9660 standard. CDs, which have been created using level 3, might show problems when they are read from other systems. However, there are no known incompatibilities with OS/2.

Independently of the ISO level specified here, long filenames will always be saved in so-called "Rock Ridge Extensions" and the "Joliet" standard. Further information about long filenames can be found in the chapter "Long Filenames".

-s Recording speed factor. If the minimum speed cannot be maintained while a cache file is written to the CD, the system will automatically slow down the recorder (depending on its capabilities) and retry to write the cache file after a few seconds.

-e Emulation mode. If specified, the recorder will emulate write operations. This should only be used to test the hardware setup.

-j If specified, don't eject the CD after it has been detached from the drive letter.

Please note that some of the older recorders don't update their internal track directory until the CD is ejected. For that reason, it's a good idea to eject the CD manually *before restarting the computer or turning off the CD recorder.* Otherwise, the recorder will attempt to write over the previously written tracks, thereby corrupting the information already saved on the CD.

-l Don't lock the drive door. This option allows ejecting the CD at any time. However, the file system doesn't expect that a CD could be ejected without an explicit request to the file system and will behave unexpected when this is done. For that reason, this option should only be used for debugging purposes.

OS/2 Commands

The file UCDWFS.DLL extends the OS/2 file management commands FORMAT, RECOVER, CHKDSK and SYS. Hence, it must be copied to a directory which is referenced by the LIBPATH statement in the system file CONFIG.SYS (this is done automatically by the installation program).

Here's a list of changes/extensions to the well-known OS/2 file management commands:

FORMAT

The following options are supported by the FORMAT command:

format z:/unseal	Remove the write protection from the CD which has been "sealed" by using the detach option –x.
Format z:/erase	In order to delete a CD-RW

In order to run these commands, you have to attach and detach the CD-ROM.

Insert the following commands in the command prompt:

- cdattach z:
- z:
- format z: /unseal or /erase
- possible copying of data
- cdattach z: -s

CHKDSK

The CHKDSK command returns information about the status of the currently inserted CD. In addition to the standard information provided by OS/2, the output contains information about the number of tracks and sessions on the CD.

The following options are supported by the CHKDSK command:

/V Return additional information (e.g. about the creator of the CD).

RECOVER

The RECOVER command starts a "repair program" in the CD Recorder. This program can sometimes correct minor errors, which have been caused by interrupted write operations.

Note: Usually, this command is not required since the file system triggers the execution of the repair program automatically once an error has been detected.

The RECOVER command does not support any options.

SYS

The SYS command is not supported by the file system.

Command Line Utilities

The *CD Writer File System* can be controlled completely from the OS/2 command line. This chapter discusses all available commands and their options in detail.

CDATTACH

The command CDATTACH allows attaching and detaching a CD to an OS/2 drive letter. To attach a CD means to associate a drive letter to the CD, while detaching refers to removing the association between the CD and its drive letter.

Syntax:

```
cdattach <drive> [-c|-s|-x|-no_flush|-l<n>]
```

Specifying only the drive letter causes the cdattach command to attach the CD to the specified drive. The optional parameters, except -l<n>, are used to detach the CD.

The following options control the behavior of the cdattach command:

-no_flush The CD is detached from its drive letter without writing any cached data. This is useful to unlock the drive tray if all other detach commands fail due to hardware errors, such as a damaged CD.

-c The cached information, if any, is written to the CD and the drive tray is unlocked. As yet, the information on the CD can only be used together with the CD Writer File System; in order to use the CD with CDROM drives, the following detach option must be used.

-s Same as -c; however, the current session will be closed as well. This allows reading the CD in standard CDROM drives. Closing a session takes about 12MB disk space, so this option should be used only if the CD is to be read by CDROM drives.

-x Like -s but, the CD will be "sealed", that is, the CD becomes write protected. The write protection can be removed at any time by using the command "format <Drive> /UNSEAL".

-l<n> Tells the file system to skip n sessions on the CD. This option allows recovering a previous CD status; this is particularly useful to recover files, which have been deleted or modified in the current session.

Additionally to the parameters described above, the following parameters allow specifying the information in the *Primary Volume Descriptor*. The information specified together with one of the following options can be retrieved with the command "chkdsk <drive> /v"

-vol_id Volume identifier (sort of detailed volume label).

-pub_id Name of the institution which has created the CD.

-prep_id Name of the person which has prepared (collected) the files on the CD.

-app_id Name of the application which has been used to create the CD.

-copyright Name of the Copyright file in the root directory.

-abstract Name of the Abstract file in the root directory.

-biblio Name of the Bibliographic file in the root directory.

If you don't want to specify the same informational parameters over and over again, the default values can be saved as environment strings. Saving the following commands in a batch file or in the system file CONFIG.SYS can do this:

```
set cdattach_vol_id=...
set cdattach_pub_id=...
set cdattach_prep_id=...
```

etc.

Note: The contents of the environment will be overwritten by the according command line parameters, that is, to change a specific field, which has been predefined in the command line just, add the according option to the command line.

If a field has been specified neither in the command line nor in the environment, the previous value - which has been derived from the existing *Primary Volume Descriptor* at the time the CD has been attached - will be used. If a field is to be deleted, it must be overwritten by a blank, e.g. by typing "cdattach z: -c -pub_id " "" .

Examples:

```
cdattach u: -c
```

This command writes all remaining data in the cache to the CD, then detaches the CD and unlocks the drive tray. As yet, the files can be accessed with the CD Recorder, only. To make the files readable by standard CDROM drives, specify the following command:

```
cdattach z: -s
```

After writing all remaining data in the cache to the CD, this command causes the current session to be closed before the CD is detached. This allows reading the CD in standard CDROM drives.

```
cdattach z: -x -pub_id "RSJ Software" -prep_id "Bugs Bunny"
```


This variation writes all cached data to the CD, closes the current session and does not reserve a new track. Consequently, the CD will be write protected until the write protection has been removed by typing 'format <Drive> /UNSEAL'.

Additionally, the information in the Primary Volume Descriptor will be partially overwritten with new contents (-pub_id and -prep_id).

CDCOPY

The command CDCOPY copies arbitrary files from/to arbitrary drives. The advantage of CDCOPY to other OS/2 copy commands is its ability to copy very large files directly. That means, instead of creating a 500MB cache file when a 500MB file is to be copied, the file is copied directly from the source to the target, bypassing the cache mechanism.

Syntax:

```
cdcopy <source file> <target file>
```

Wildcards such as "?" or "*" are not allowed here. The source file and the target file must be specified completely.

Example:

```
cdcopy c:\longfile.dat z:\longfile.dat
```

This example copies a file named LONGFILE.DAT from the hard disk to the CD. Even if the file is larger than the cache size (e.g. 250MB), the file will be copied into a single track. This allows reading the CD under DOS and Windows (NT).

If complete directory trees are to be copied, use the following syntax:

```
cdcopy <source path> <target path> /s
```

Wildcards are explicitly allowed in the source specification. The target path, however, must point to the desired drive/directory without any wildcards; if the target directory does not exist, it will be created automatically.

Example:

```
cdcopy c:\os2\* z:\os2 /s
```

This command copies all files from c:\os2, including all subdirectories (APPS, DLL, SYSTEM, ...) into the same directory on the CD.

CDSPEED

The CDSPEED utility allows changing the recording speed of the CD recorder. It can be used

- to change the speed of the currently attached recorder, or
- to change the default speed which will be applied the next time a CD is attached.

Syntax:

```
cdspeed [drive] [-s <speed factor>] -e
```

If a drive letter is specified, the recording speed of the according CD recorder will be changed immediately. Otherwise, only the default speed will be changed. Using CDSPEED without a drive letter has the same effect as changing the -s option in the CDWFS.IFS command line, followed by a subsequent reboot.

Note: If the recorder is currently writing, the speed cannot be changed. In that case, just wait until the write indicator on the recorder is off before using this command.

Examples:

```
cdspeed z: -s2
```

This command changes both the default value for subsequent sessions as well as the current recording speed. The new speed factor is 2 (double speed, 300KB/s).

```
cdspeed -s4 -e
```

This command changes the speed factor for subsequent sessions to quad speed (600KB/s) and turns on write emulation. Please note that the speed of a currently attached CD recorder will not be changed unless the CD is detached, then attached again.

CDWPOPUP

The error log utility CDWPOPUP tracks all SCSI errors, which have been returned by the CD Recorder. These errors are usually fatal errors, such as damaged CDs, hardware errors, etc.

The error log runs in the background and is usually invisible. If desired, it can be popped up manually by double-clicking its title in the Window List.

Once an error has been detected, the according error message is displayed on the screen. Further details about the error can be viewed by pressing Detailed Information. The contents of the detailed information screen are discussed in the section Problem Determination.

Enter the following command to start the error log:

```
start cdwpopup
```

Since CDWPOPUP creates an error-log file in the current directory, it must be started on a drive with write permission.

Caution: In no case, attempt to start the error log in a directory which points to an attached CD. Otherwise, changing the CD would also "change" the error-log file. Besides, using the CD as the drive for the error-log file could lead to a "racing condition", that is, once an error has been generated by accessing the CD, CDWPOPUP would access the very same CD to update the error log, which would lead to yet another error, which would cause CDWPOPUP to access the CD again, ...

Further information about the error log can be found in the section Problem Determination.

CDDRV.INF

This file offers information about the recorders, which are supported by our software.

Every line describes one recorder.

Technical Details

This section provides some background information about the internal structure of a CD. This knowledge might help optimizing the utilization of the CD Writer File System.

Note: In order to keep the required base knowledge as low as possible, unnecessary details are omitted. Also, the proportions of the graphs in this section might not meet the physical proportions on the CD.

ISO9660

This standard has been defined by ISO (the International Standards Organization) and specifies how the information on a CD has to be organized to allow using the same CD on multiple platforms. The CD Writer File System complies with this standard, so each ISO9660-capable platform should be able to read the CDs, which have been written by the CD Writer.

Internal Structure of a CD

Each conventional CDROM has a table of contents (TOC) and one or more tracks.

The table of contents does not contain the name and the position of the files - as the name would imply - but the mode and position of each track on the CD. The file directory (which contains the name and position of the files on the CD) is saved in one of the tracks.

Track

A track is an area on the CD, which can hold user data. Music CDs, for example, allocate a separate track for each title. A CD can contain 99 tracks.

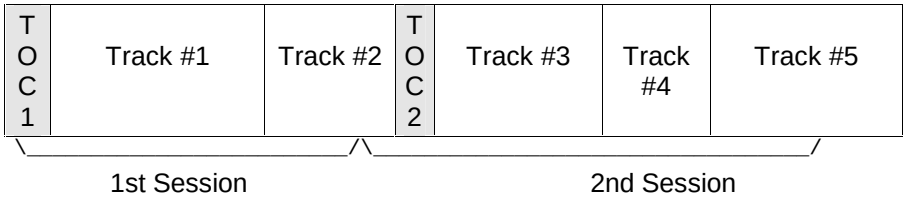
Most CD Recorders require each track to be written at once. This is the reason why a minimum transfer rate (e.g. 300KB/s for double-spin recorders) must be maintained while the track is written.

Note: Newer recorders support a write mode called *Incremental Packet Writing*, which allows stopping and restarting a write operation while keeping the current track; however, they still include so-called link blocks, which cause gaps in the track data. We're currently not using this mode since it provides no real benefit with our software.

The *CD Writer File System* collects as many files as possible in its cache memory, then writes the contents of the cache to the CD in a single write operation. Otherwise, the maximum number of 99 tracks would be reached after 99 files have been copied to the CD.

Multisession CDs

Most available CD Recorders are WORM (Write Once - Read Multiple) devices. Since each area on the CD can be written only once, repeated write operations require multiple TOCs. A CD with more than one TOC is called a Multisession CD.



Each table of contents is associated to its corresponding session. Detaching a CD with the option *-c* does not close the current session, thus the information about the new tracks is not written into a new TOC.

Since standard CDROM drives use the TOC to locate each track on the CD, the latest files on CDs, which have been modified without closing the current session, are not readable in standard CDROM drives. However, the CD Recorder uses a reserved area to save the latest track information and will always be able to access all tracks, even without an up-to-date TOC.

Note: A session requires about 12MB disk space. Hence, a session should only be closed if the CD is to be used in standard CDROM drives.

Track Modes

Each track is divided into sectors with 3234 bytes. Taking away internal data areas such as sector identifiers, 1st-level error correction, etc., each sector yields 2352 bytes of raw data.

Audio

Audio tracks do not contain any additional error correction; the complete user data area is used for digitized music or speech. Additional error correction is not required for audio tracks because the human ear usually can't recognize small errors in the audio data.

Mode 1, Form 1

This is the original CDROM data format. Each data sector contains 2048 bytes; the remaining bytes in the sector are used for system information and a better error correction.

This track format can be read by all CDROM drives.

Mode 1, Form 2

Yet another data format, this time without additional error correction. The error correction data has been stripped to a few bytes to be able to detect data errors, but they can't be corrected anymore. In return, each data sector contains 2336 bytes.

This format has been used by various (older) multimedia applications to store audio and video information.

Mode 2, Form 1

Equal to Mode 1, Form 1, with the exception those 8 unused bytes from the error correction area at the end of the sector have been moved to the system data area at the beginning of the sector. This format is used by Kodak's Photo CDs.

Note: This track format can be read by Photo CD compatible CDROM drives, only. Unfortunately, there are a couple of CDROM drivers (and drivers) which assume that a multisession CD must be recorded with Mode 2, Form 1 tracks. Since Version 1.52, the RSJ CD Writer is also using this track mode to remain compatible to those drives.

The extended system data area is used to identify the sector type and allows switching between Mode 2, Form 1 and Mode 2, Form 2 sectors within a track.

Mode 2, Form 2

Similar to Mode 1, Form 2. This format is used by modern XA applications (e.g. Video CDs) to save audio and video information and yields 2324 bytes of user data.

Note: This track format can be read by Photo CD compatible CDROM drives, only.

XA, Photo-CD, Multisession

This chapter describes some of the various keywords, which are used in conjunction with CDROM technology and applications.

XA

XA (Extended Architecture) has been introduced by various companies to allow reading audio and video information in a contiguous data stream. Reading different data types at once is made possible by interleaving the information. XA requires Mode 2, Form 1 and Mode 2, Form 2 compatible CDROM drives.

Photo-CD

Beside the additional information for CDI players, a Photo CD, like any other data CD, consists of various files, which contain the picture data. An empty Photo CD can be distinguished from Writable CDs only by its label.

Photo CDs use the track format Mode 2, Form 1; hence, old CDROM drives won't be able to read Photo CDs.

Warning: The CD Writer File System recognizes Photo CDs as writable CDs, which are currently, write protected. Using the command 'format <Drive> /unseal' will remove the write protection; however, writing to a Photo CD might cause troubles if the CD is to be used together with CDI players. For that reason, writing to partially filled Photo CDs should be prevented.

Multisession

Multisession CDs have been introduced together with Kodak's Photo CD: Each Photo CD, which has been sent in the second time automatically, becomes a multisession CD.

Note: The CD Writer File System produces multisession CDs as well. Some CDROM drives are capable of reading the new Mode 2, Form 1 track format but cannot handle multiple sessions. Although some vendors claim their drives are Photo CD compatible, these drives will always be restricted to the first session on the CD.

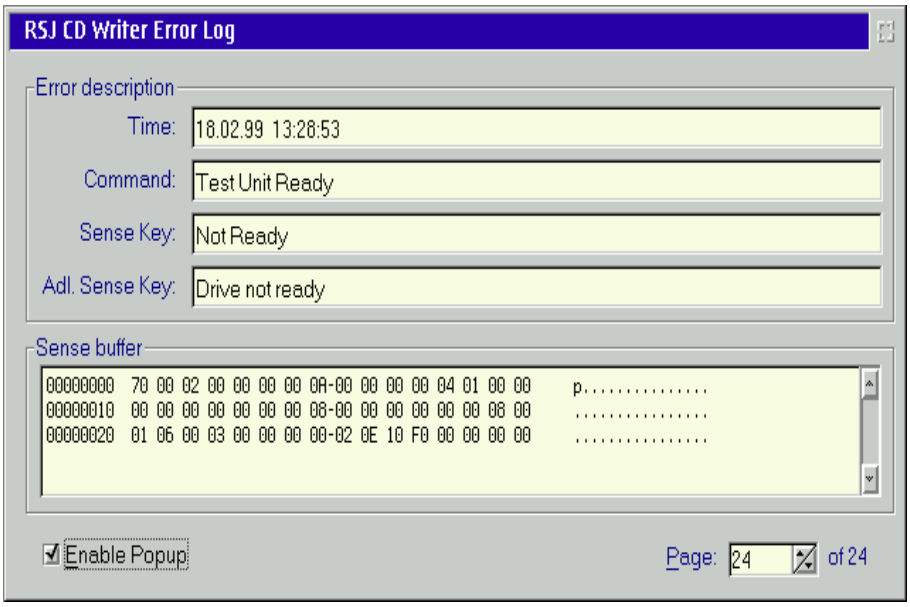
Programming

The documentation of the programming interface is now available as a separate document. If needed it can be obtained free of charge from our Web server http://www.rsj.de.

Problem Determination

This section provides useful information about determining and correcting common problems.

CDWPOPUP



CDWPOPUP is usually started automatically and stays in the background until an error is returned by the CD recorder. Since there's no icon while *CDWPOPUP* is minimized, you'll have to use the window list to restore the program.

CDWPOPUP is used to log and display errors, which are returned by the CD recorder. The error messages are specific to the recorder being used and, in some cases, don't tell the average end user much about the original problem. However, our technical support relies on the information collected by *CDWPOPUP* to diagnose the problems.

Note: A damaged CD shouldn't be used together with the CD Recorder anymore. However, all previously closed sessions should be accessible by standard CDROM drives.

OS/2 Error

All errors returned by the file system are standard OS/2 error codes. If necessary, enter the following command to get more information about the error:

```
help sys????
```

where the four question marks are to be replaced by the returned error number.

Error Table

The following table contains information about common errors along with possible solutions to the problem:

Sense Key	Adl. Sense Key	Cause/Correction
Illegal Request	N/A	The cache size is too large, causing OS/2 to get into trouble locking the buffer for the write operation. This can be fixed by reducing the cache size in the installation program
Illegal Request	Invalid Block Address	The CD status does not match the file system status. Detach the CD with the command 'cdattach <drive> -no_flush'.
Medium Error	Unable to read PMA, TOC or Subcode	The CD is either damaged or dirty. If cleaning the CD doesn't help, the CD will have to be replaced.

Sense Key	Adl. Sense Key	Cause/Correction
Medium Error	Absorption Control Error	The track could not be written successfully. Usually, this error indicates that the CD has been removed during write operations. Also, rebooting the computer without detaching the CD first can be the cause for this error. The CD is damaged and must be replaced.
Hardware Error	*	The CD Recorder has detected an internal error. Detach the CD with the command 'cdattach <drive> -no_flush', turn the unit off, then on again and retry the write operation. If the error persists, contact the service representative for the CD Recorder.
Unit Attention	*	The CD has been forcibly changed or the CD Recorder has been turned off while the CD was still attached to a drive letter. Retry the same command again.

CDATTACH

The command CDATTACH displays the OS/2 error message associated to the error code returned by the file system. The most common error messages are:

Error Message	Cause/Correction
Device not ready	The CD Recorder is either turned off or no CD has been inserted.
Access denied	The CD Recorder has already been attached to a drive letter or the connection to the CD Recorder cannot be established.
General error	The CD Recorder could not identify the currently inserted CD. The CD might be damaged.
File not found	The SCSI device driver name (default: RSJSCSI$) could not be found. Check the name of the SCSI device driver.

CDCOPY

The command CDCOPY displays the OS/2 error message associated to the error code returned by the file system. The most common error messages are:

Error	Cause/Correction
Invalid file name	The source or target filename is invalid. Check the command syntax as well as the specified file names.
Invalid directory	see above
The pipe has been ended	The minimum transfer rate of the CD Recorder could not be maintained. The command CDCOPY is bypassing the file system cache and relies on fast source drives. Hence, it should only be used if the source file resides on a local hard disk or a fast network (e.g. 16MBit/s Token Ring). If the source drive is a CDROM, the speed of the CDROM should exceed the speed of the CD Recorder by at least 50%. Retry the command with a faster source drive or use standard copy commands such as COPY or XCOPY.

Further Errors

The following table contains errors, which can't be associated to a particular command. Especially a bad configuration can cause the errors described here.

Error	**Cause/Correction**

Error	**Cause/Correction**
The device driver RSJSCSI.SYS prints the error message: can't connect to SCSI device manager	The SCSI device manager OS2SCSI.DMD could not be found. This error occurs if no adapter driver (.ADD) for the host adapter has been installed. Reinstall the SCSI adapter support. Make sure the CD Recorder is properly connected and turned on while the system is booting.
CD Recorder can't be attached to a drive letter	• The CD Recorder is not ready (no CD, drive turned off, improper connections). • Drive has been turned off or disconnected while the system has been started. • The entries in the system file CONFIG.SYS are incomplete. This can be corrected by reinstalling the CD Writer File System. • The adapter device driver (BASEDEV=????????.ADD in the system file CONFIG.SYS) has not been installed properly. • The drive has already been allocated by another device driver or device manager (e.g. OS2ASPI.DMD). In this case, the offending device driver must be either removed or configured such that the CD Recorder is not allocated. If you are using OS2ASPI.DMD, try adding the parameter /SHARE to its command line. **Note:** Changing the load sequence will have no effect to the above problem. • The CD Recorder is identifying itself with an unknown ID during the SCSI INQUIRE command. If the drive is compatible to one of the supported device groups, the unknown ID can be specified in the file system's command line (=> Reference Section, CDWFS.IFS). • The CD Recorder claims to be a CDROM drive. See the chapter LOCKCDR.FLT for more information about converting such CD Recorders to WORM devices.

Error	Cause/Correction
	• The CD Recorder is malfunctioning.
CD is write protected	• The CD is a CDROM. Only writable CDs can be written to. Writable CDs can be distinguished by their golden (sometimes gleaming green) color. • The CD already contains too many tracks. This can be verified with the CHKDSK command. • The CD is out-of-disk space. • The CD has been write protected with the command 'cdattach <drive> -x'. The write protection can be removed by typing 'format <drive> /unseal'. • The previously written files cannot be read in a CDROM drive • The CD has been detached without closing the current session. Attach CD again and detach with the command 'cdattach <drive> -x'. • The CD contains multiple sessions while the CDROM drive is not capable of reading multiple sessions. • The CDROM driver software (e.g. MSCDEX) cannot handle multiple sessions. In this case, try to get an updated version of the software. • There are too many sessions on the CD. Some CDROM drives seem to have trouble handling many sessions. This error doesn't seem to be reproducible; in most cases, reinserting the CD solves the problem.
CD cannot be detached	• The last write operation has caused an error. If retrying the operation does not help, detach the CD by typing 'cdattach <drive> -no_flush'. The data written since the CD has been attached will be lost. • • Drive is not attached to the expected drive letter. This can be verified by typing 'dir <drive>'.

Error	Cause/Correction
Session cannot be closed	• The CD is damaged or dirty. If the problem persists even after CD has been replaced, the following might be appropriate: • The adapter/recorder combination does not support proper timeout processing.

Frequently Asked Question (FAQ)

The following sections contain some of the most frequently asked questions about the RSJ CD Writer File System.

Incorrect SCSI termination or wiring

Our customer support experience showed that many problems are caused by an incorrect SCSI termination or installation. Please make absolutely sure that your system is correctly configured and terminated. This especially applies to WIDE or U2W SCSI adapters.
In the following section we provide a short and hopefully helpful guide concerning correct termination and wiring.

Termination

A SCSI bus always has to be terminated at both ends. If there is both an external and an internal wire, the internal cable has to be terminated at its end as well as the external cable. To do this, activate the termination on the last device or use a special terminator.

Please also make sure that no device in the chain may be terminated. This happens for example if the adapter is terminated and a device is attached to the external slot connector.

If you use a WIDE adapter that has its wide (16 bit) bus connected to a narrow (8 bit) external port you have to make sure that the high order byte of the bus is properly terminated. This can be achieved using the adapter's setup program or, with onboard SCSI adapters, by a special slot adapter.

However, many onboard adapters come with a slot panel that does not provide proper termination of the high order byte of the wide bus. These slots should not be used.

Correct wiring

SCSI devices must be connected using a single wire as a „daisy chain“ without any forks. With WIDE adapters providing three internal connectors you have to observe that two of these connectors are connected to the same bus. Using these two connectors at the same time results in a fork that is not allowed and very likely to cause problems.

SCSI cable length

The maximum cable length differs depending on the interface type:

Number of devices (incl. Adapter)	SCSI-1	SCSI-2	Ultra(W)-SCSI	U2W-SCSI
1 – 4 devises	6 meter	3 meter	3 meter	12 meters
5 – 7 devices	3 meter	3 meter	1 meter	12 meters

If both external and internal devices are used, the lengths of both cables have to be added.

Please make sure that there is a minimum cable length of 30 cm (approx 7.5 “) between each device.

If these explanations do not solve your problem, please ask your hardware dealer or check the manual of your SCSI adapter.

Synchronous transfer

Most recorders produce errors if they are operated in “Sync Transfer mode”. But there’s no rule without exception:
Plextor and Teac recorders require sync transfer mode!

Some SCSI adapters set this option automatically depending on the device, others (e.g. Adaptec) require you to set this option manually.

If you are using an Adaptec controller, you can verify this setting in the adapters’s setup program (press Ctrl+A during system boot). Make sure that the “Initiate sync negotiation” option is OFF for your recorder’s SCSI id.

Caution:
Certain Adaptec controller versions do not load the adapter BIOS if there are no hard disks connected to it. In this case, the adapter setup program options are ignored. This is indicated by a “Adapter BIOS not installed” or similar message.

Using recorders that are not officially supported by RSJ CD Writer

If your recorder is not supported by our software, but is compatible to one that is, you can force it to be recognized and used by following these instructions:

- After installation, open the CDDRV.INF file in the installation directory
- Copy the line of the compatible recorder to the bottom of the file
- Modify the first four columns of the new line so they match your recorder
- Move the ID string of the compatible recorder to the compatible ID column
- Add ‘-i:”ID_OF_YOUR_RECORDER”’ to the LOCKCDR.FLT call in your CONFIG.SYS file
- Reboot your system

During boot LOCKCDR.FLT should announce that the recorder has been changed into a WORM-drive. If this is not the case, “ID_OF_YOUR_RECORDER” does not exactly match the name of the recorder.

If you get the “changed to WORM” message during boot but a “device not found” error when trying to attach the recorder you probably mistyped the SCSI id string in the CDDRV.INF file.

Memory faults

Sometimes, a memory fault (RAM) is causing the problems. Most of today’s computers don’t use parity bits anymore, so a memory error remains undetected until some several problems show up. If in doubt, try to slow down the memory access with the BIOS setup program. Disabling the 2nd level cache for test purposes can also be helpful.

Writable CDs cannot be read by certain CDROM drives.

Unfortunately, there's no general solution for this kind of problems. The CDROM drives must be able to read CD-XA tracks and multiple sessions. Sometimes, a specific combination of CD recorders and CDROM drives causes problems. For example, the NEC 6x CDROM drive CDR502 can only read the first session if the CD has been created by a Yamaha CDR100 recorder.

In rare cases, CDROM drives cannot handle more than about 80 tracks. In this case, try to increase the cache size as mentioned above to reduce the number of tracks on the CD.

Sometimes, a CDROM drive doesn't recognize all sessions on the CD

Even though the number of sessions on a CD is not limited by the according standards, some drives cannot handle more than about 10 sessions. In case of problems, try to limit the number of session to a number below 10.

When copying the last audio track, an error message pops up which claims that there was a read error. However, the audio track apparently has been copied completely.

It's difficult to determine the end of the last audio track. We'll watch this problem and suppress the error message in a later version if we don't find any real errors. Since the target CD was OK in all cases we've heard about, this can be considered a cosmetic problem for now.

System Requirements

This section lists the system requirements necessary to run the RSJ CD Writer File System.

Hardware

The following hardware requirements must be met:

- IBM compatible PC with 80386 processor or higher
- SCSI host adapter with OS/2 support (e.g. Adatec or NCR) or
- IDE adapter with OS/2 support
- at least 16 MB main memory
- supported CD-recorder

A list of supported SCSI host adapters and CD Recorders can be found at our web Site http://www.rsj.de

Software

The following software requirements must be met:

- IBM OS/2 Version 2.1 or higher
- Adapter Device Driver (.ADD) for the SCSI host adapter
- ASPI support

Appendix

The appendix contains general-purpose information and specifications for the utilization of the CD Writer File System as well as the currently active restrictions.

CDROM

CDs created by the *RSJ CD Writer File System* can be read by virtually all CD-ROM drives and operation systems available today.

The following restrictions should be considered:

- Reading CDs with multiple sessions requires multisession-capable CD-ROMs. Rather old CD-ROM drives (e.g. single or double speed) might not support multisession CDs.
- In addition to a multisession-capable CDROM drive, the CDROM software (e.g. MSCDEX) must be able to handle multiple sessions. This should be the case with most software versions currently in use. If in doubt, please consult the software manufacturer.

Mastering

The RSJ CD Writer File System has primarily been designed to create CDs in small quantities, e.g. for backup applications, customer-specific CDs, transferring data with CDs (e.g. for DTP), creating prototypes, etc.

If a CD is to be used for mass production, it is recommended to notify the CDROM manufacturer of the fact that the files on the prototype CD should be copied into a single track on a new CD before a glass master is created. Otherwise, the internal layout of the CD - multiple tracks and sessions, with gaps between each track (caused by the CD Recorder) - could cause problems when producing or using the CD-ROMs.

Please note that this is not a limitation of the CD Writer File System. Actually, Kodak's Photo CDs have the same basic layout (multiple tracks and sessions), thus will cause the same problems if they are used to print CD-ROMs.

Conditions of Use

1. This software package contains a software product and the according documentation. We would like to emphasize that the current technology cannot guarantee error-free programs, especially if they are used together with programs, which have been developed by third-party companies.
2. Subject of this license, however, is a generally usable application program. The customer is responsible for the selection, installation and utilization of the software product as well as any intended results.
3. This license grants the right to use the software on a single machine at any time. As far as the software has been modified or included into another software product, the software is likewise restricted to being used on the same single machine.
4. The provided, modified or associated software and documentation may be copied for backup purposes, only. All copies of the software and the documentation are protected by condition #3 as well.
5. This software contains a copyright notice. Each backup copy or modification and each part which has been included into another software product must contain this copyright notice.
6. The customer can transfer the rights granted by this license agreement to a third person. This causes all rights to the software product, including any backup copies and modifications, to be transferred as well. For that reason, the customer must delete any remaining (backup) copies or modifications.
7. Law prohibits utilization beyond the terms of this license.

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