NAME

cdrecord − record audio or data Compact Discs from a master

SYNOPSIS

cdrecord [*general options*] **dev=***device* [*track options*] *track1. . .trackn*

DESCRIPTION

Cdrecord is used to record data or audio Compact Discs on an Orange Book CD-Recorder.

The *device* refers to *scsibus*/*target*/*lun* of the CD-Recorder. Communication on *SunOS* is done with the SCSI general driver **scg.** Other operating systems are using a library simulation of this driver. Possible syntax is: **dev=** *scsibus*,*target*,*lun* or **dev=** *target*,*lun*. In the latter case, the CD-Recorder has to be connected to the default SCSI bus of the machine. *Scsibus*, *target* and *lun* are integer numbers. Some operating systems or SCSI transport implementations may require to specify a filename in addition. In this case the correct syntax for the device is: **dev=** *devicename*:*scsibus*,*target*,*lun* or **dev=** *devicename*:*target*,*lun*. If the name of the device node that has been specified on such a system refers to exactly one SCSI device, a shorthand in the form **dev=** *devicename*:@ or **dev=** *devicename*:@,*lun* may be used instead of **dev=** *devicename*:*scsibus*,*target*,*lun*.

To access remote SCSI devices, you need to prepend the SCSI device name by a remote device indicator. The remote device indicator is either **REMOTE:***user@host:* or **REMOTE:***host:*
A valid remote SCSI device name may be: **REMOTE:***user@host:* to allow remote SCSI bus scanning or **REMOTE:***user@host:1,0,0* to access the SCSI device at *host* connected to SCSI bus # 1,target 0 lun 0.

To access SCSI devices via alternate transport layers, you need to prepend the SCSI device name by a transport layer indicator. The transport layer indicator may be something like **USCSI:** or **ATAPI:**. To get a list of supported transport layers for your platform, use **dev=** *HELP*:

To make **cdrecord** portable to all UNIX platforms, the syntax **dev=** *devicename*:*scsibus*,*target*,*lun* is preferred as is hides OS specific knowledge about device names from the user. A specific OS must not necessarily support a way to specify a real device file name nor a way to specify *scsibus*,*target*,*lun*.

Scsibus 0 is the default SCSI bus on the machine. Watch the boot messages for more information or look into **/var/adm/messages** for more information about the SCSI configuration of your machine. If you have problems to figure out what values for *scsibus*,*target*,*lun* should be used, try the **−scanbus** option of **cdrecord** described below.

If a file /etc/default/cdrecord exists, the parameter to the **dev=** option may also be a drive name label in said file (see FILES section).

On **SVr4** compliant systems, **cdrecord** uses the the real time class to get the highest scheduling priority that is possible (higher than all kernel processes). On systems with **POSIX real time scheduling** cdrecord uses real time scheduling too, but may not be able to gain a priority that is higher than all kernel processes.

In *Track At Once* mode, each *track* corresponds to a single file that contains the prepared data for that track. If the argument is '**−**', standard input is used for that track. Only one track may be taken from *stdin*.

GENERAL OPTIONS

General options must be before any track file name or track option.

−version

Print version information and exit.

−v Increment the level of general verbosity by one. This is used e.g. to display the progress of the writing process.

−V Increment the verbose level in respect of SCSI command transport by one. This helps to debug problems during the writing process, that occur in the CD-Recorder. If you get incomprehensible error messages you should use this flag to get more detailed output. **−VV** will show data buffer content in addition. Using **−V** or **−VV** slows down the process and may be the reason for a buffer underrun.

debug=*#,* **-d**
Set the misc debug value to # (with debug=#) or increment the misc debug level by one (with -d). If you specify *-dd,* this equals to **debug=***2.* This may help to find problems while opening a driver for libscg as well as with sector sizes and sector types. Using **−debug** slows down the process and may be the reason for a buffer underrun.

kdebug=#, **kd=#**
Tell the **scg**-driver to modify the kernel debug value while SCSI commands are running.

−silent, **−s**
Do not print out a status report for failed SCSI commands.

−force Force to continue on some errors. Be careful when using this option. **Cdrecord** implements several checks that prevent you from doing unwanted things like damaging CD-RW media by improper drives. Many of the sanity checks are disabled when the **−force** option is used.

This option also implements some tricks that will allow you to blank bad CD-RW disks.

−immed
Tell cdrecord to set the **SCSI IMMED** flag in certain commands (load/eject/blank/close_track/close_session). This can be useful on broken systems with ATAPI harddisk and CD/DVD writer on the same bus or with SCSI systems that don't use disconnect/reconnect. These systems will freeze while blanking or fixating a CD/DVD or while a DVD writer is filling up a session to the minimum amount (approx. 800 MB). Setting the **−immed** flag will request the command to return immediately while the operation proceeds in background, making the bus usable for the other devices and avoiding the system freeze. This is an experimental feature which may work or not, depending on the model of the CD/DVD writer. A correct solution would be to set up a correct cabling but there seem to be notebooks around that have been set up the wrong way by the manufacturer. As it is impossible to fix this problem in notebooks, the **−immed** option has been added.

A second experimental feature of the **−immed** flag is to tell cdrecord to try to wait short times wile writing to the media. This is expected to free the IDE bus if the CD/DVD writer and the data source are connected to the same IDE cable. In this case, the CD/DVD writer would otherwise usually block the IDE bus for nearly all the time making it impossible to fetch data from the source drive. See also **minbuf=** and **−v** option.

Use both features at your own risk. It it turns out that it would make sense to have a separate option for the the wait feature, write to the author and convince him.

minbuf=*value*
The # **minbuf=** options allows to define the minimum drive buffer fill ratio for the experimental ATAPI wait mode that is intended to free the IDE bus to allow hard disk and CD/DVD writer to be on the same IDE cable. As the wait mode currently only works when the verbose option **−v** has been specified, **cdrecord** implies the verbose option in case the **−immed** or **minbuf=** option have been specified. Valid values for **minbuf=** are between 25 and 95 for 25%…95% minimum drive buffer fill ratio.

–dummy
The CD-Recorder will go through all steps of the recording process, but the laser is turned off during this procedure. It is recommended to run several tests before actually writing to a Compact Disk or Digital Versatile Disk, if the timing and load response of the system is not known.

–dao Set **SAO (Session At Once)** mode which is usually called **Disk At Once** mode. This currently only works with MMC drives that support **Session At Once** mode.

–raw Set **RAW writing mode.** Using this option defaults to **–raw96r**.

–raw96r
Select Set **RAW writing mode** with 2352 byte sectors plus 96 bytes of raw P-W subchannel data resulting in a sector size of 2448 bytes. This is the preferred raw writing mode as it gives best control over the CD writing process. If you find any problems with the layout of a disk or with sub channel content (e.g. wrong times on the display when playing the CD) and your drive supports to write in **–raw96r** or **–raw16** mode, you should give it a try. There are several CD writers with bad firmware that result in broken disks when writing in TAO or SAO mode. Writing data disks in raw mode needs significantly more CPU time than other write modes. If your CPU is too slow, this may result in buffer underruns.

–raw96p
Select Set **RAW writing mode** with 2352 byte sectors plus 96 bytes of packed P-W subchannel data resulting in a sector size of 2448 bytes. This is the less preferred raw writing mode as only a few recorders support it and some of these recorders have bugs in the firmware implementation. Don't use this mode if your recorder supports **–raw96r** or **–raw16**. Writing data disks in raw mode needs significantly more CPU time than other write modes. If your CPU is too slow, this may result in buffer underruns.

–raw16
Select Set **RAW writing mode** with 2352 byte sectors plus 6 bytes of P-Q subchannel data resulting in a sector size of 2368 bytes. If a recorder does not support **–raw96r**, this is the preferred raw writing mode. It does not allow to write *CD-Text* or *CD+Graphics* but it is the only raw writing mode in cheap CD writers. As these cheap writers in most cases do not support **–dao** mode. Don't use this mode if your recorder supports **–raw96r**. Writing data disks in raw mode needs significantly more CPU time than other write modes. If your CPU is too slow, this may result in buffer underruns.

–multi Allow multi session CD's to be made. This flag needs to be present on all sessions of a multi session disk, except you want to create a session that will be the last session on the media. The fixation will be done in a way that allows the CD-Recorder to append additional sessions later. This is done by generation a TOC with a link to the next program area. The so generated media is not 100% compatible to manufactured CD's (except for CDplus). Use only for recording of multi session CD's. If this option is present, the default track type is **CD-ROM XA mode 2**. The *Sony* drives have no hardware support for **CD-ROM XA mode 2**. You have to specify the **–data** option in order to create multi session disks on these drives. As long as cdrecord does not have a coder for converting data sectors to audio sectors, you need to force **CD-ROM** sectors by including the **–data** option if you like to record a multisession disk in SAO mode. Not all drives allow multisession CD's in SAO mode.

–msinfo
Retrieve multi session info in a form suitable for **mkisofs-1.10** or later.

This option makes only sense with a CD that contains at least one closed session and is appendable (not finally closed yet). Some drives create error messages if you try to get the multi session info for a disk that is not suitable for this operation.

–toc Retrieve and print out the table of content or PMA of a CD. With this option, **cdrecord** will work with CD-R drives and with CD-ROM drives.

−atip Retrieve and print out the ATIP (absolute Time in Pregroove) info of a CD/DVD recordable or CD/DVD rewritable media. With this option, **cdrecord** will try to retrieve the ATIP info. If the actual drive does not support to read the ATIP info, it may be that only a reduced set of information records or even nothing is displayed. Only a limited number of MMC compliant drives support to read the ATIP info.

If **cdrecord** is able to retrieve the lead-in start time for the first session, it will try to decode and print the manufacturer info from the media. DVD media dos not have atip information but there is equivalent prerecorded information that is read out and printed.

−fix The disk will only be fixated (i.e. a TOC for a CD-Reader will be written). This may be used, if for some reason the disk has been written but not fixated. This option currently does not work with old TEAC drives (CD-R50S and CD-R55S).

−nofix Do not fixate the disk after writing the tracks. This may be used to create an audio disk in steps. An un-fixated disk can usually not be used on a non CD-writer type drive but there are audio CD players that will be able to play such a disk.

−waiti Wait for input to become available on standard input before trying to open the SCSI driver. This allows **cdrecord** to read it's input from a pipe even when writing additional sessions to a multi session disk. When writing another session to a multi session disk, **mkisofs** needs to read the old session from the device before writing output. This cannot be done if **cdrecord** opens the SCSI driver at the same time.

−load Load the media and exit. This only works with a tray loading mechanism but seems to be useful when using the Kodak disk transporter.

−eject Eject disk after doing the work. Some Devices (e.g. Philips) need to eject the medium before creating a new disk. Doing a −dummy test and immediately creating a real disk would not work on these devices.

speed=#

Set the speed factor of the writing process to #. # is an integer, representing a multiple of the audio speed. This is about 150 KB/s for CD-ROM and about 172 KB/s for CD-Audio. If no *speed* option is present, **cdrecord** will try to get the speed value from the **CDR_SPEED** environment. If your drive has problems with *speed=2* or *speed=4*, you should try *speed=0*.

blank=*type*

Blank a CD-RW and exit or blank a CD-RW before writing. The blanking type may be one of:

help	Display a list of possible blanking types.
all	Blank the entire disk. This may take a long time.
fast	Minimally blank the disk. This results in erasing the PMA, the TOC and the pregap.
track	Blank a track.
unreserve	Unreserve a reserved track.
trtail	Blank the tail of a track.
unclose	Unclose last session.
session	Blank the last session.

Not all drives support all blanking types. It may be necessary to use **blank=all** if a drive reports a specified command as being invalid. If used together with the **−force** flag, this option may be used to blank CD-RW disks that otherwise cannot be blanked. Note that you may need to specify **blank=***all* because some drives will not continue with certain types of bad CD-RW disks. Note also that **cdecord** does it's best if the **−force** flag is used but it finally depends on the drive's firmware whether the blanking operation will succeed or not.

fs=# Set the fifo (ring buffer) size to #. You may use the same method as in **dd**(1), **sdd**(1) or **star**(1). The number representing the size is taken in bytes unless otherwise specified. If a number is followed directly by the letter ‘b’, ‘k’, ‘m’, ‘s’ of ‘f’, the size is multiplied by 512, 1024, 1024*1024, 2048 or 2352. If the size consists of numbers separated by ‘x’ or ‘*’, multiplication of the two numbers is performed. Thus *fs=10x63k* will specify a fifo size of 630 kBytes.

The size specified by the *fs*= argument includes the shared memory that is needed for administration. This is at least one page of memory. If no *fs*= option is present, **cdrecord** will try to get the fifo size value from the **CDR_FIFOSIZE** environment. The default fifo size is currently 4 MB.

The fifo is used to increase buffering for the real time writing process. It allows to run a pipe from **mkisofs** directly into **cdrecord**. If the fifo is active and a pipe from **mkisofs** into **cdrecord** is used to create a CD, **cdrecord** will abort prior to do any modifications on the disk if **mkisofs** dies before it starts writing. The recommended fifo size is between 4 and 32 MBytes. As a rule of thumb, the fifo size should be at least equal to the size of the internal buffer of the CD-Recorder and no more than half of the physical amount of RAM available in the machine. If the fifo size is big enough, the fifo statistics will print a fifo empty count of zero and the fifo min fill is not below 20%. It is not wise to use too much space for the fifo. If you need more than 8 MB to write a CD on an idle machine, your machine is either underpowered, has hardware problems or is mis-configured. The sun4c architecture (e.g. a Sparcstation-2) has only MMU page table entries for 16 MBytes per process. Using more than 14 MBytes for the fifo may cause the operating system in this case to spend much time to constantly reload the MMU tables. Newer machines from Sun do not have this MMU hardware problem. I have no information on PC-hardware reflecting this problem.

If you have buffer underruns or similar problems and observe a zero *fifo empty count*, you have hardware problems. The fifo size in this case is sufficient.

dev=*target*

Sets the SCSI target for the CD-Recorder, see notes above. A typical device specification is **dev=***6,0* . If a filename must be provided together with the numerical target specification, the filename is implementation specific. The correct filename in this case can be found in the system specific manuals of the target operating system. On a *FreeBSD* system without *CAM* support, you need to use the control device (e.g. */dev/rcd0.ctl*). A correct device specification in this case may be **dev=***/dev/rcd0.ctl:@* .

On Linux, drives connected to a parallel port adapter are mapped to a virtual SCSI bus. Different adapters are mapped to different targets on this virtual SCSI bus.

If no *dev* option is present, **cdrecord** will try to get the device from the **CDR_DEVICE** environment.

If the argument to the **dev=** option does not contain the characters ’,’, ’/’, ’@’ or ’:’, it is interpreted as an label name that may be found in the file /etc/default/cdrecord (see FILES section).

gracetime=*#*

Set the grace time before starting to write to # seconds. Values below 2 seconds are not allowed.

timeout=*#*

Set the default SCSI command timeout value to # seconds. The default SCSI command timeout is the minimum timeout used for sending SCSI commands. If a SCSI command fails due to a timeout, you may try to raise the default SCSI command timeout above the timeout value of the failed command. If the command runs correctly with a raised command timeout, please report the better timeout value and the corresponding command to the author of the program. If no *timeout* option is present, a default timeout of 40 seconds is used.

driver=*name*

Allows to use a user supplied driver name for the device. To get a list of possible drivers use **driver=help**. The reason for the existence of this option is to allow users to use **cdrecord** with drives that are similar to supported drives but not known directly by **cdrecord**. Use this option with extreme care. If a wrong driver is used for a device, the possibility of creating corrupted disks is high. The minimum problem related to a wrong driver is that the **−speed** or **−dummy** will not work.

There are two special driver entries in the list: **cdr_simul** and **dvd_simul**. These driver entries are designed to make timing tests at any speed or timing tests for drives that do not support the **−dummy** option. The simulation drivers implement a drive with a buffer size of 1MB that can be changed via the **CDR_SIMUL_BUFSIZE** environment variable. The simulation driver correctly simulates even a buffer underrun condition. If the **−dummy** option is present, the simulation is not aborted in case of a buffer underrun.

driveropts=*option list*

Set driver specific options. The options are specified a comma separated list. To get a list of valid options use **driveropts=***help* together with the *−checkdrive* option. Currently implemented driver options are:

burnfree

Turn the support for Buffer Underrun Free writing on. This only works for drives that support Buffer Underrun Free technology. This may be called: **Sanyo BURN-Proof**, **Ricoh Just-Link**, **Yamaha Lossless-Link** or similar.

The default is to turn **BURN-Free** off, regardless of the defaults of the drive.

noburnfree

Turn the support for Buffer Underrun Free writing off.

varirec=*value*

Turn on the **Plextor VariRec** writing mode. The mandatory parameter *value* is the laser power offset and currently may be selected from -2, -1, 0, 1, 2. In addition, you need to set the write speed to 4 in order to allow **VariRec** to work.

audiomaster

Turn on the **Yahama Audio Master Q. R.** feature which usually should result in high quality CDs that have less reading problems in HiFi players. As this is implemented as a variant of the Session at Once write mode, it will only work if you select SAO write mode and there is no need to turn it off. The **Audio Master** mode will work with a limited speed but may also be used with data CDs. in **Audio Master** mode, the pits on the CD will be written larger then usual so the capacity of the medium is reduced when turning this feature on. A 74 minute CD will only have a capacity of 63 minutes if **Audio Master** is active and the capacity of a 80 minute CD will be reduced to 68 minutes.

forcespeed

Normally, modern drives know the highest possible speed for different media and may reduce the speed in order to grant best write quality. Some drives (e.g. Ricoh and Yamaha) allow to force the drive to use the selected speed even if the medium is so bad that the write quality would be poor. This option tells such a drive to force to use the selected speed regardless of the medium quality.

Use this option with extreme care and note that the drive should know better which medium will work at full speed. The default is to turn **forcespeed** off, regardless of the defaults of the drive.

noforcespeed

Turn off the **force speed** feature.

tattooinfo

Use this option together with **−checkdrive** to retrieve the image size information for the **Yamaha DiskT@2** feature. The images always have a line length of 3744 pixel. Line number 0 (radius 0) is mapped to the center of the disk. If you know the inner and outer radius you will be able to create a pre distorted image that later may appear undistorted on the disk.

tattoofile=*name*

Use this option together with **−checkdrive** to write an image prepared for the **Yamaha DiskT@2** feature to the medium. The file must be a file with raw image B&W data (one byte per pixel) in a size as retrieved by a previous call to **tattoofile=***name* . If the size of the image equals the maximum possible size (3744 x 320 pixel), **cdrecord** will use the first part of the file. This first part then will be written to the leftover space on the CD.

Note that the image must be mirrored to be readable from the pick up side of the CD.

−checkdrive

Checks if a driver for the current drive is present and exit. If the drive is a known drive, **cdrecord** uses exit code 0.

−prcap Print the drive capabilities for SCSI-3/mmc compliant drives as obtained from mode page 0x2A. Values marked with *kB* use 1000 bytes as kilo-byte, values marked with *KB* use 1024 bytes as Kilo-byte.

−inq Do an inquiry for the drive, print the inquiry info and exit.

−scanbus

Scan all SCSI devices on all SCSI busses and print the inquiry strings. This option may be used to find SCSI address of the CD-Recorder on a system. The numbers printed out as labels are computed by: **bus * 100 + target**

−reset Try to reset the SCSI bus where the CD recorder is located. This works not on all operating systems.

−overburn

Allow **cdrecord** to write more than the official size of a medium. This feature is usually called *overburning* and depends on the fact that most blank media may hold more space than the official size. As the official size of the lead-out area on the disk is 90 seconds (6750 sectors) and a disk usually works if there are at least 150 sectors of lead out, all media may be overburned by at least 88 seconds (6600 sectors). Most CD recorders only do overburning in **SAO** or **RAW** mode. Known exceptions are TEAC CD-R50S, TEAC CD-R55S and the Panasonic CW-7502. Some drives do now allow to overburn as much as you might like and limit the size of a CD to e.g. 76 minutes. This problem may be circumvented by writing the CD in RAW mode because this way the drive has no chance to find the size before starting to burn. There is no guarantee that your drive supports overburning at all. Make a test to check if your drive implements the feature.

−ignsize

Ignore the known size of the medium. This options should be used with extreme care, it exists only for debugging purposes don’t use it for other reasons. It is not needed to write disks with more than the nominal capacity. This option implies **−overburn**.

−useinfo

Use *.inf files to overwrite audio options. If this option is used, the pregap size information is read from the *.inf file that is associated with the file that contains the audio data for a track.

defpregap=#

Set the default pre-gap size for all tracks except track number 1. This option currently only makes sense with the TEAC drive when creating track-at-once disks without the 2 second silence before each track.
This option may go away in future.

−packet

Set **Packet writing mode.** This is an experimental interface.

pktsize=#
Set the packet size to #, forces fixed packet mode. This is an experimental interface.

−noclose
Do not close the current track, useful only when in packet writing mode. This is an experimental interface.

mcn=*med_cat_nr*
Set the **Media Catalog Number** of the CD to *med_cat_nr*.

−text Write CD-Text created by **cdrecord** and based on information taken from a file that contains ascii information for the text strings. Currently only the format in the ***.inf** files created by **cdda2wav** is supported. You need to use the **−useinfo** option in addition in order to tell **cdrecord** to read these files. If you like to write your own CD-Text information, edit the ***.inf** files with a text editor and change the field that are relevant for CD-Text.

textfile=filename
Write CD-Text based on information found in the binary file *filename*. This file must contain information in a data format defined in the SCSI-3 MMC-2 standard and in the Red Book. The four byte size header that is defined in the SCSI standard is optional and allows to make the recognition of correct data less ambiguous. This is the best option to be used to copy CD-Text data from existing CDs that already carry CD-Text information. To get data in a format suitable for this option use **cdrecord −vv −toc** to extract the information from disk.

TRACK OPTIONS

Track options may be mixed with track file names.

isrc=*ISRC_number*
Set the **International Standard Recording Number** for the next track to *ISRC_number*.

index=*list*
Sets an index list for the next track. In index list is a comma separated list of numbers that are counting from index 1. The first entry in this list must contain a 0, the following numbers must be an ascending list of numbers (counting in 1/75 seconds) that represent the start of the indices. An index list in the form: 0,7500,15000 sets index 1 to the start of the track, index 2 100 seconds from the start of the track and index 3 200 seconds from the start of the track.

−audio If this flag is present, all subsequent tracks are written in **CD-DA** (similar to Red Book) audio format. The file with data for this tracks should contain stereo, 16-bit digital audio with 44100 samples/s. The byte order should be the following: MSB left, LSB left, MSB right, LSB right, MSB left and so on. The track should be a multiple of 2352 bytes. It is not possible to put the master image of an audio track on a raw disk because data will be read in multiple of 2352 bytes during the recording process.

If a filename ends in *.au* or *.wav* the file is considered to be a structured audio data file. **Cdrecord** assumes that the file in this case is a Sun audio file or a Microsoft .WAV file and extracts the audio data from the files by skipping over the non-audio header information. In all other cases, cdrecord will only work correctly if the audio data stream does not have any header. Because many structured audio files do not have an integral number of blocks (1/75th second) in length, it is often necessary to specify the **−pad** option as well. **cdrecord** recognizes that audio data in a .WAV file is stored in Intel (little-endian) byte order, and will automatically byte-swap the data if the CD recorder requires big-endian data. **Cdrecord** will reject any audio file that does not match the Red Book requirements of 16-bit stereo samples in PCM coding at 44100 samples/second.

Using other structured audio data formats as input to **cdrecord** will usually work if the structure of the data is the structure described above (raw pcm data in big-endian byte order). However, if the data format includes a header, you will hear a click at the start of a track.

If neither −*data* nor −*audio* have been specified, **cdrecord** defaults to −*audio* for all filenames that end in *.au* or *.wav* and to −*data* for all other files.

−swab If this flag is present, audio data is assumed to be in byte-swapped (little-endian) order. Some types of CD-Writers e.g. Yamaha, Sony and the new SCSI-3/mmc drives require audio data to be presented in little-endian order, while other writers require audio data to be presented in the big-endian (network) byte order normally used by the SCSI protocol. **Cdrecord** knows if a CD-Recorder needs audio data in big- or little-endian order, and corrects the byte order of the data stream to match the needs of the recorder. You only need the −*swab* flag if your data stream is in Intel (little-endian) byte order.

Note that the verbose output of **cdrecord** will show you if swapping is necessary to make the byte order of the input data fit the required byte order of the recorder. **Cdrecord** will not show you if the −*swab* flag was actually present for a track.

−data If this flag is present, all subsequent tracks are written in **CD-ROM mode 1** (Yellow Book) format. The data is a multiple of 2048 bytes. The file with track data should contain an **ISO-9660** or **Rock Ridge** filesystem image (see **mkisofs** for more details). If the track data is an **ufs** filesystem image, fragment size should be set to 2 KB or more to allow CR-drives with 2 KB sector size to to be used for reading.

−data is the default, if no other flag is present.

If neither −*data* nor −*audio* have been specified, **cdrecord** defaults to −*audio* for all filenames that end in *.au* or *.wav* and to −*data* for all other files.

−mode2
If this flag is present, all subsequent tracks are written in **CD-ROM mode 2** format. The data is a multiple of 2048 bytes.

−xa1 If this flag is present, all subsequent tracks are written in **CD-ROM XA mode 1** format. The data is a multiple of 2048 bytes.

−xa2 If this flag is present, all subsequent tracks are written in **CD-ROM XA mode 2** format. The data is a multiple of 2048 bytes.

−cdi If this flag is present, all subsequent tracks are written in **CDI** format. The data is a multiple of 2048 bytes.

−isosize
Use the **ISO-9660** file system size as the size of the next track. This option is needed if you want **cdrecord** to directly read the image of a track from a raw disk partition or from a *TAO* master CD. In the first case the option **−isosize** is needed to limit the size of the CD to the size of the ISO filesystem. In the second case the option **−isosize** is needed to prevent **cdrecord** from reading the two run out blocks that are appended by each CD-recorder in track at once mode. These two run out blocks cannot be read and would cause a buffer under run that would cause a defective copy. Do not use this option on files created by **mkisofs** and in case **cdrecord** reads the track data from *stdin*. In the first case, you would prevent **cdrecord** from writing the amount of padding that has been appended by **mkisofs** and in the latter case, it will not work because *stdin* is not seekable.

If **−isosize** is used for a track, **cdrecord** will automatically add padding for this track as if the **−pad** option has been used but the amount of padding may be less than the padding written by **mkisofs**. Note that if you use **−isosize** on a track that contains Sparc boot information, the boot information will be lost.

Note also that this option cannot be used to determine the size of a file system if the multi session option is present.

−pad If the track is a data track, 15 sectors of zeroed data will be added to the end of this and each subsequent data track. In this case, the **−pad** option is superseded by the **padsize=** option. It will remain however as a shorthand for **padsize=***15s.* If the *−pad* option refers to an audio track, **cdrecord** will pad the audio data to be a multiple of 2352 bytes. The audio data padding is done with binary zeroes which is equal to absolute silence.

−pad remains valid until disabled by **−nopad**.

padsize=#
Set the amount of data to be appended as padding to the next track to #. Opposed to the behavior of the **−pad** option, the value for *padsize=* is reset to zero for each new track. Cdrecord assumes a sector size of 2048 bytes for the *padsize=* option, independent from the real sector size and independent from the write mode. The megabytes mentioned in the verbose mode output however are counting the output sector size which is e.g. 2448 bytes when writing in RAW/RAW96 mode. See **fs=** option for possible arguments. To pad the equivalent of 20 minutes on a CD, you may write **padsize=**20x60x75s. Use this option if your CD-drive is not able to read the last sectors of a track or if you want to be able to read the CD on a **Linux** system with the ISO-9660 filesystem read ahead bug. If an empty file is used for track data, this option may be used to create a disk that is entirely made of padding. This may e.g. be used to find out how much overburning is possible with a specific media.

−nopad
Do not pad the following tracks − the default.

−shorttrack
Allow all subsequent tracks to violate the Read Book track length standard which requires a minimum track length of 4 seconds. This option is only useful when used in SAO or RAW mode. Not all drives support this feature. The drive must be accept the resulting CUE sheet or support RAW writing.

−noshorttrack
Re-enforce the Red Book track length standard. Tracks must be at least 4 seconds.

pregap=#
Set the pre-gap size for the next track. This option currently only makes sense with the TEAC drive when creating track-at-once disks without the 2 second silence before each track.
This option may go away in future.

−preemp
If this flag is present, all TOC entries for subsequent audio tracks will indicate that the audio data has been sampled with 50/15 µsec preemphasis. The data, however is not modified during the process of transferring from file to disk. This option has no effect on data tracks.

−nopreemp
If this flag is present, all TOC entries for subsequent audio tracks will indicate that the audio data has been mastered with linear data − this is the default.

−copy If this flag is present, all TOC entries for subsequent audio tracks of the resulting CD will indicate that the audio data has permission to be copied without limit. This option has no effect on data tracks.

−nocopy
If this flag is present, all TOC entries for subsequent audio tracks of the resulting CD will indicate that the audio data has permission to be copied only once for personal use − this is the default.

−scms If this flag is present, all TOC entries for subsequent audio tracks of the resulting CD will indicate that the audio data has no permission to be copied anymore.

tsize=# If the master image for the next track has been stored on a raw disk, use this option to specify the valid amount of data on this disk. If the image of the next track is stored in a regular file, the size of that file is taken to determine the length of this track. If the track contains an ISO 9660 filesystem image use the *−isosize* option to determine the length of that filesystem image.
In Disk at Once mode and with some drives that use the TEAC programming interface, even in

Track at Once mode, **cdrecord** needs to know the size of each track before starting to write the disk. Cdrecord now checks this and aborts before starting to write. If this happens you will need to run **mkisofs -print-size** before and use the output (with ‘s’ appended) as an argument to the **tsize=** option of **cdrecord** (e.g. tsize=250000s).
See **fs=** option for possible arguments.

EXAMPLES

For all examples below, it will be assumed that the CD-Recorder is connected to the primary SCSI bus of the machine. The SCSI target id is set to 2.

To record a pure CD-ROM at double speed, using data from the file *cdimage.raw*:

cdrecord −v speed=2 dev=2,0 cdimage.raw

To create an image for a ISO 9660 filesystem with Rock Ridge extensions:

mkisofs −R −o cdimage.raw /home/joerg/master/tree

To check the resulting file before writing to CD on Solaris:

mount −r −F fbk −o type=hsfs /dev/fbk0:cdimage.raw /mnt

On Linux:

mount cdimage.raw −r −t iso9660 −o loop /mnt

Go on with:
ls −lR /mnt
umount /mnt

If the overall speed of the system is sufficient and the structure of the filesystem is not too complex, cdrecord will run without creating an image of the ISO 9660 filesystem. Simply run the pipeline:

mkisofs −R /master/tree | cdrecord −v fs=6m speed=2 dev=2,0 -

The recommended minimum fifo size for running this pipeline is 4 MBytes. As the default fifo size is 4 MB, the **fs=** option needs only be present if you want to use a different fifo size. If your system is loaded, you should run mkisofs in the real time class too. To raise the priority of **mkisofs** replace the command

mkisofs −R /master/tree
by
priocntl −e −c RT −p 59 mkisofs −R /master/tree

on Solaris and by

nice --18 mkisofs −R /master/tree

on systems that don’t have **UNIX International** compliant realtime scheduling.

Cdrecord runs at priority 59 on Solaris, you should run mkisofs at no more than priority 58. On other systems, you should run mkisofs at no less than nice --18.

Creating a CD-ROM without file system image on disk has been tested on a Sparcstation-2 with a Yamaha CDR-400. It did work up to quad speed when the machine was not loaded. A faster machine may be able to handle quad speed also in the loaded case.

To record a pure CD-DA (audio) at single speed, with each track contained in a file named *track01.cdaudio*, *track02.cdaudio*, etc:

cdrecord −v speed=1 dev=2,0 -audio track*.cdaudio

To check if it will be ok to use double speed for the example above. Use the dummy write option:

cdrecord −v −dummy speed=2 dev=2,0 −audio track*.cdaudio

To record a mixed-mode CD with an ISO 9660 filesystem from *cdimage.raw* on the first track, the other tracks being audio tracks from the files *track01.cdaudio*, *track02.cdaudio*, etc:

cdrecord −v −dummy dev=2,0 cdimage.raw −audio track*.cdaudio

To handle drives that need to know the size of a track before starting to write, first run

mkisofs -R -q -print-size /master/tree

and then run

mkisofs -R /master/tree | cdrecord speed=2 dev=2,0 tsize=XXXs -

where *XXX* is replaced by the output of the previous run of mkisofs.

To copy an audio CD in the most accurate way, first run

cdda2wav -vall cddb=0 -D2,0 -B -Owav

and then run

cdrecord -v dev=2,0 -dao -useinfo -text *.wav

This will try copy track indices and to read CD-Text information from disk. If there is no CD-Text information, **cdda2wav** will try to get the information from freedb.org instead.

ENVIRONMENT

CDR_DEVICE
This may either hold a device identifier that is suitable to the open call of the SCSI transport library or a label in the file /etc/default/cdrecord.

CDR_SPEED
Sets the default speed value for writing (see also **−speed** option).

CDR_FIFOSIZE
Sets the default size of the FIFO (see also **fs=#** option).

CDR_FORCERAWSPEED
If this environment variable is set, **cdrecord** will allow you to write at the full RAW encoding speed a single CPU supports. This will create high potential of buffer underruns. Use with care.

RSH If the **RSH** environment is present, the remote connection will not be created via **rcmd**(3) but by calling the program pointed to by **RSH**. Use e.g. **RSH=**/usr/bin/ssh to create a secure shell connection.

Note that this forces **cdrecord** to create a pipe to the **rsh(1)** program and disallows **cdrecord** to directly access the network socket to the remote server. This makes it impossible to set up performance parameters and slows down the connection compared to a **root** initiated **rcmd(3)** connection.

RSCSI If the **RSCSI** environment is present, the remote SCSI server will not be the program **/opt/schily/sbin/rscsi** but the program pointed to by **RSCSI**. Note that the remote SCSI server program name will be ignored if you log in using an account that has been created with a remote SCSI server program as login shell.

FILES

/etc/default/cdrecord
Default values can be set for the following options in /etc/default/cdrecord. For example: CDR_FIFOSIZE=8m or CDR_SPEED=2

CDR_DEVICE
This may either hold a device identifier that is suitable to the open call of the SCSI transport library or a label in the file /etc/default/cdrecord that allows to identify a specific drive on the system.

CDR_SPEED
Sets the default speed value for writing (see also **–speed** option).

CDR_FIFOSIZE
Sets the default size of the FIFO (see also **fs=#** option).

Any other label
is an identifier for a specific drive on the system. Such an identifier may not contain the characters ',', '/', '@' or ':'.

Each line that follows a label contains a TAB separated list of items. Currently, three items are recognized: the SCSI ID of the drive, the default speed that should be used for this drive and the default FIFO size that should be used for this drive. The values for *speed* and *fifosize* may be set to -1 to tell cdrecord to use the global defaults. A typical line may look this way:

teac1= 0,5,0 4 8m

yamaha= 1,6,0 -1 -1

This tells **cdrecord** that a drive named *teac1* is at scsibus 0, target 5, lun 0 and should be used with speed 4 and a FIFO size of 8 MB. A second drive may be found at scsibus 1, target 6, lun 0 and uses the default speed and the default FIFO size.

SEE ALSO

cdda2wav(1), **readcd**(1), **scg**(7), **fbk**(7), **mkisofs**(8), **rcmd**(3), **ssh**(1).

NOTES

On Solaris you need to stop the volume management if you like to use the USCSI fallback SCSI transport code. Even things like **cdrecord -scanbus** will not work if the volume management is running.

Disks made in **Track At Once** mode are not suitable as a master for direct mass production by CD manufacturers. You will need the **disk at once** option to record such disks. Nevertheless the disks made in **Track At Once** will normally be read in all CD players. Some old audio CD players however may produce a two second click between two audio tracks.

The minimal size of a track is 4 seconds or 300 sectors. If you write smaller tracks, the CD-Recorder will add dummy blocks. This is not an error, even though the SCSI-error message looks this way.

Cdrecord has been tested on an upgraded Philips CDD-521 recorder at single and double speed on a SparcStation 20/502 with no problems, slower computer systems should work also. The newer Philips/HP/Plasmon/Grundig drives as well as Yamaha CDR-100 and CDR-102 work also. The Plasmon RF-4100 work, but has not tested in multi session. A Philips CDD-521 that has not been upgraded will not work. The Sony CDU-924 has been tested, but does not support XA-mode2 in hardware. The sony therefore cannot create conforming multi session disks. The Ricoh RO-1420C works, but some people seem to have problems to use them with speed=2, try speed=0 in this case.

The Yamaha CDR-400 and all new SCSI-3/mmc conforming drives are supported in single and multi-session.

You should run several tests in all supported speeds of your drive with the **–dummy** option turned on if you are using **cdrecord** on an unknown system. Writing a CD is a realtime process. **NFS** will not always deliver constantly the needed data rates. If you want to use **cdrecord** with CD-images that are located on a **NFS** mounted filesystem, be sure that the fifo size is big enough. I used **cdrecord** with with medium load on a SS20/502 and even at quad speed on a Sparcstation-2 which was heavily loaded, but it is recommended to leave the system as lightly loaded as possible while writing a CD. If you want to make sure that buffer underruns are not caused by your source disk, you may use the command

cdrecord -dummy dev=2,0 padsize=600m /dev/null

to create a disk that is entirely made of dummy data. **Cdrecord** needs to run as root to get access to the **/dev/scg?** device nodes and to be able to lock itself into memory.

If you don't want to allow users to become root on your system, **cdrecord** may safely be installed suid root. This allows all users or a group of users with no root privileges to use **cdrecord. Cdrecord** in this case checks, if the real user would have been able to read the specified files. To give all user access to use **cdrecord,** enter:

```
chown root /usr/local/bin/cdrecord
chmod 4711 /usr/local/bin/cdrecord
```

To give a restricted group of users access to cdrecord enter:

```
chown root /usr/local/bin/cdrecord
chgrp cdburners /usr/local/bin/cdrecord
chmod 4710 /usr/local/bin/cdrecord
```

and add a group *cdburners* on your system.

Never give write permissions for non root users to the */dev/scg?* devices unless you would allow anybody to read/write/format all your disks.

You should not connect old drives that do not support disconnect/reconnect to either the SCSI bus that is connected to the CD-Recorder or the source disk.

A Compact Disc can have no more than 99 tracks.

When creating a disc with both audio and data tracks, the data should be on track 1 otherwise you should create a CDplus disk which is a multi session disk with the first session containing the audio tracks and the following session containing the data track.

Many operating systems are not able to read more than a single data track, or need special software to do so.

More information on the SCSI command set of a HP CD-Recorder can be found at:

http://www.hp.com/isgsupport/cdr/index.html

If you have more information or SCSI command manuals for currently unsupported CD-Recorders please contact the author.

The Philips CDD 521 CD-Recorder (even in the upgraded version) has several firmware bugs. Some of them will force you to power cycle the device or to reboot the machine.

When using **cdrecord** with the broken **Linux SCSI generic driver.** You should note that **cdrecord** uses a hack, that tries to emulate the functionality of the scg driver. Unfortunately, the sg driver on **Linux** has several severe bugs:

- It cannot see if a SCSI command could not be sent at all.
- It cannot get the SCSI status byte. **Cdrecord** for that reason cannot report failing SCSI commands in some situations.
- It cannot get real DMA count of transfer. **Cdrecord** cannot tell you if there is an DMA residual count.
- It cannot get number of bytes valid in auto sense data. **Cdrecord** cannot tell you if device transfers no sense data at all.
- It fetches to few data in auto request sense (CCS/SCSI-2/SCSI-3 needs >= 18).

The fifo percent output is computed just after a block of data has been written to the CD-Recorder. For this reason, there will never be 100% fifo fill, while the fifo is in streaming mode.

DIAGNOSTICS

You have 9 seconds to type ^C to abort **cdrecord** after you see the message:

Starting to write CD at speed %d in %s mode for %s session.

A typical error message for a SCSI command looks like:

```
cdrecord: I/O error. test unit ready: scsi sendcmd: no error
CDB:  00 20 00 00 00 00
status: 0x2 (CHECK CONDITION)
Sense Bytes: 70 00 05 00 00 00 00 0A 00 00 00 00 25 00 00 00 00 00
Sense Key: 0x5 Illegal Request, Segment 0
Sense Code: 0x25 Qual 0x00 (logical unit not supported) Fru 0x0
Sense flags: Blk 0 (not valid)
cmd finished after 0.002s timeout 40s
```

The first line gives information about the transport of the command. The text after the first colon gives the error text for the system call from the view of the kernel. It usually is: **I/O error** unless other problems happen. The next words contain a short description for the SCSI command that fails. The rest of the line tells you if there were any problems for the transport of the command over the SCSI bus. **fatal error** means that it was not possible to transport the command (i.e. no device present at the requested SCSI address).

The second line prints the SCSI command descriptor block for the failed command.

The third line gives information on the SCSI status code returned by the command, if the transport of the command succeeds. This is error information from the SCSI device.

The fourth line is a hex dump of the auto request sense information for the command.

The fifth line is the error text for the sense key if available, followed by the segment number that is only valid if the command was a *copy* command. If the error message is not directly related to the current command, the text *deferred error* is appended.

The sixth line is the error text for the sense code and the sense qualifier if available. If the type of the device is known, the sense data is decoded from tables in *scsierrs.c* . The text is followed by the error value for a field replaceable unit.

The seventh line prints the block number that is related to the failed command and text for several error flags. The block number may not be valid.

The eight line reports the timeout set up for this command and the time that the command really needed to complete.

The following message is not an error:

```
Track 01: Total bytes read/written: 2048/2048 (1 sectors).
cdrecord: I/O error. flush cache: scsi sendcmd: no error
CDB:  35 00 00 00 00 00 00 00 00 00
status: 0x2 (CHECK CONDITION)
Sense Bytes: F0 00 05 80 00 00 27 0A 00 00 00 00 B5 00 00 00 00 00
Sense Key: 0x5 Illegal Request, Segment 0
Sense Code: 0xB5 Qual 0x00 (dummy data blocks added) Fru 0x0
Sense flags: Blk -2147483609 (valid)
cmd finished after 0.002s timeout 40s
```

It simply notifies, that a track that is smaller than the minimum size has been expanded to 300 sectors.

BUGS

Cdrecord has even more options than **ls**.

There should be a recover option to make disks usable, that have been written during a power failure.

CREDITS

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For creating the experimental packet writing support, the first implementation of CD-RW blanking support, the first .wav file decoder and many nice discussions on cdrecord.

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for making libedc_ecc available (needed to write RAW data sectors).

MAILING LISTS

If you want to actively take part on the development of cdrecord, you may join the developer mailing list via this URL:

http://lists.berlios.de/mailman/listinfo/cdrecord-developers

The mail address of the list is: **cdwrite@other.debian.org**

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Additional information can be found on:
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If you have support questions, send them to:

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Of you have definitely found a bug, send a mail to:

cdrecord-developers@berlios.de
or **schilling@fokus.fhg.de**

To subscribe, use:

http://lists.berlios.de/mailman/listinfo/cdrecord-developers
or **http://lists.berlios.de/mailman/listinfo/cdrecord-support**

The old cdwrite mailing list may be joined by sending mail to:

cdwrite-request@other.debian.org

and including the word *subscribe* in the body. The mail address of the list is:

cdwrite@other.debian.org