

GNU VCDImager

\$Id: vcdimager.texi,v 1.8 2001/03/17 16:19:19 hvr Exp \$
The GNU Video CD Image Maker
for version 0.6.2rc2, 7 May 2001

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Introduction

This manual describes the *GNU VCDImager*¹ package, which provides a front end, ‘*vcdimager*’, for generating CD-ROM image files suitable for being burned to CD recordables. It takes MPEG movie files as input and generates an image file and a cue-sheet file which can be fed to any CD-recording program which understands the BIN/CUE-format, like *cdrdao*² for instance.

Features of the back end library³, on which all front ends relay, include:

- Video CD 1.1 image output support
- Video CD 2.0 image output support
- Super Video CD 1.0 image output support
- general facility for adding files as mode 2 form 1 and 2 sectors to the ISO9660 file-system and setting the ISO9660 volume label and application id fields.
- support for up to 98 MPEG tracks per (Super) Video CD.
- supports 99 minute CD-R media⁴.

Also contained in this package is ‘*vcdrrip*’, a tool for dumping information about (Super) Video CD image files⁵ and extracting the contained MPEG-streams.

¹ see <http://www.gnu.org/software/vcdimager/>

² see <http://www.ping.de/sites/daneb/cdrdao.html>

³ the core of the GNU VCDImager package consists of a library named *libvcd*, the front ends are just user interfaces to the exported C-API

⁴ ...though most devices will have problems with such out of specification media. You may want use the ‘*--sector-2336*’ option for images longer than 80 minutes

⁵ on Linux it is supported to operate directly on CD-ROM devices

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Version 2, June 1991

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1 Video CD Concepts

This chapter gives some background information regarding the underlying Video CD technology.

Warning: All information given in this chapter is given without any warranty of accuracy or correctness. You are encouraged to send corrections and improvements for this manual to bug-vcdimager@gnu.org.

1.1 General Information

The Video Compact Disc (*Video CD* or *VCD*) is a standardized digital video storage format. It is based on the commonly available Compact Disc technology, which allows for low cost video authoring. Video CDs can be played in most DVD stand-alone player, dedicated VCD players and finally most modern computer based systems with multimedia support.

1.2 Anatomy of Video CDs

In general the layout of a Video CD is made up of the following areas:

- ISO9660 data track
 - ISO9660 structure at 00:02:00, consisting of 16 empty sectors, primary volume descriptor (*PVD*) and directory records with file pointers to the later mentioned information area structures and external pointers to MPEG/CD-DA tracks following the ISO9660 data track.
 - Karaoke area at 00:03:00
 - Video CD information area at 00:04:00
 - optional segment play item area with MPEG items aligned in 150 sector segments
 - optional program and data file area, for additional files added to the ISO9660 track
- up to 98 MPEG mode 2 form 2 or CD-DA tracks embedded in lead-in and lead-out empty sectors.

1.3 Known Video CD Flavors

There are different Video CD flavors commonly used. The following sections tries to explain the differences amongst them.

1.3.1 Video CD 1.1

This is the most basic Video CD specification dating back to 1993¹, which has the following characteristics:

- one mode 2 mixed form ISO9660 track containing file pointers to the information areas
- up to 98 multiplexed MPEG-1 audio/video streams or CD-DA audio tracks
- up to 500 MPEG track entry points

The Video CD specification requires the multiplexed MPEG-1 stream to have a CBR of about 174300 bytes per second² in order to accommodate single speed CD-ROM drives. The CBR MPEG-1, layer II audio stream is fixed at 224kbps with 1 stereo or 2 mono channels. to have one of the following two resolutions:

¹ actually this flavor was based on the Karaoke-CD, which was the first MPEG based CD-ROM format.

² 2324 bytes of payload per sector * 75 sectors per second = 174300 bytes per second

- 352 x 240 @ 29.97 Hz (NTSC)
- 352 x 240 @ 23.976 Hz (FILM)

1.3.2 Video CD 2.0

About two years after the Video CD 1.1 specification came out, an improved Video CD 2.0 standard was published. This one added the following items to the features already available in the 1.1 specification:

- Support for (optional) MPEG segment play items (*SPI*), consisting of still pictures, motion pictures or audio streams, was added.
- Support for (optional) interactive playback control (*PBC*) was added.
- Support for (optional) playing related access by providing a scan point index file was added ('EXT/SCANDATA.DAT')

By adding PAL support to the Video CD 1.1 specification, the following resolution become available:

- 352 x 240 @ 29.97 Hz (NTSC)
- 352 x 240 @ 23.976 Hz (FILM)
- 352 x 288 @ 25 Hz (PAL)

1.3.3 Extended Video CD

Also known as *XVCD*, this is not an official standard. It's actually just a name for VCDs trying to break conformance to the official standards in order to use the additional performance of the DVD decoders and thus achieve better image quality. Such a XVCD may be unsupported by many available stand-alone playing devices.

1.3.4 Super Video CD 1.0

With the upcoming of the DVD media, a new VCD standard had to be published in order to be able to keep up with technology, so the Super Video CD specification was called into life. Most notably a switch from MPEG-1 CBR to MPEG-2 VBR encoding for the video stream was performed. Based on the Video CD 2.0 features the following items are new:

- Use of MPEG-2 encoding instead of MPEG-1 for the video stream
- Allowed VBR encoding of MPEG-1 audio stream
- Higher resolutions (see below) for the video stream resolution.
- Overlay graphics and text (*OGT*) sub-channel coding for user switchable subtitle displaying

For the Super Video CD only the following two resolutions are supported for motion pictures:

- 480 x 480 @ 29.97 Hz (NTSC)
- 480 x 576 @ 25 Hz (PAL)

1.3.5 Extended Super Video CD

Just like the XVCD, and thus also known as *XSVCD*, this is not an official standard and may not work with all playing devices supporting SVCDs.

2 Reference

2.1 ‘vcdimager’ Tool

There are a few command-line options for ‘vcdimager’ at the moment:

```
$ vcdimager --help
Usage: vcdimager [OPTION...]
  -t, --type=TYPE                select VideoCD type ('vcd11',
                                'vcd2' or 'svcd') (default: 'vcd2')
  -c, --cue-file=FILE            specify cue file for output
                                (default: 'videocd.cue')
  -b, --bin-file=FILE            specify bin file for output
                                (default: 'videocd.bin')
  -l, --iso-volume-label=LABEL   specify ISO volume label for video
                                cd (default: 'VideoCD')
  --iso-application-id=LABEL     specify ISO application id for
                                video cd (default: '')
  --info-album-id=LABEL          specify album id for video cd set
                                (default: '')
  --volume-count=NUMBER          specify number of volumes in
                                album set
  --volume-number=NUMBER         specify album set sequence number
                                (< volume-count)
  --broken-svcd-mode             enable non-compliant compatibility
                                mode for broken devices
  --sector-2336                 use 2336 byte sectors for output
  --add-dir=DIR                  add directory contents recursively
                                to ISO fs root
  --add-file=FILE,ISO_FILENAME  add single file to ISO fs
  --add-file-2336=FILE,ISO_FILENAME
                                add file containing full 2336 byte
                                sectors to ISO fs
  -p, --progress                 show progress
  -v, --verbose                  be verbose
  -q, --quiet                    show only critical messages
  -V, --version                  display version and copyright
                                information and exit

Help options:
  -?, --help                     Show this help message
  --usage                        Display brief usage message

$
```

2.1.1 Requirements For input MPEG streams

GNU VCDImager expects MPEG streams in a format suitable for (Super) Video CD production.

2.1.1.1 Video CD

The Video CD specification requires the multiplexed MPEG-1 stream to have a bit rate of about 174300 bytes per second. The video stream is required to have one of the following resolutions:

- 352 x 240 @ 29.97 Hz (NTSC)
- 352 x 240 @ 23.976 Hz (FILM)
- 352 x 288 @ 25 Hz (PAL) (not supported on VCD 1.x!)

The audio stream must be MPEG-1 layer II, fixed to a 224 kbits/sec CBR with 1 stereo or 2 mono audio channels.

2.1.1.2 Super Video CD

When creating Super Video CD images MPEG-2 VBR streams are expected with a maximum allowed bit-rate of ~2.6 mbits/sec. The following video resolutions are (officially) supported¹:

- 480 x 480 @ 29.97 Hz (NTSC)
- 480 x 576 @ 25 Hz (PAL)

There are a few other requirements imposed the specification, like the need to encode scan information as user data in the picture layer of all intra pictures, and the requirement to precede every I picture by a GOP header which shall be preceded by a sequence header in its turn and possibly begin all in the same packet, thus forming a so called access point sector.

The audio stream must be MPEG-1 layer II, with a bit-rate ranging from 32 to 384 kbps kbits/sec bit-rate with up to 2 stereo or 4 mono channels, or 1 extended MPEG-1/2 multichannel (5+1) surround sound stream.

2.1.1.3 Common Constraints

Furthermore the MPEG files should be aligned to 2324 byte MPEG packet boundaries. If they aren't GNU VCDImager will try to align them on the fly while issuing a warning that padding was needed.

If on-the-fly padding should fail, you can try fixing those files with VCDpad² or any other program capable of aligning or fixing MPEG packets.

2.1.2 Adding Files to the Video CD

Files can be added to the ISO file-system, that is the first track of the Video CD, by making use of the command-line options '`--add-file=FILE,ISO_FILENAME`' and '`--add-file-2336=FILE,ISO_FILENAME`'. The latter option allows you to include files containing the complete user data of mode 2 CD-ROM sectors³.

The path name given as *ISO_FILENAME* determines where to link the file in the file-system of the Video CD. The given path name must be a valid ISO9660 file name with the following restrictions:

- The Character set is restricted to upper case letters, numbers, the underscore '`_`', the dot '`.`' and the slash '`/`'.
- The maximum file name length is restricted to 31 characters, the directory nesting level is restricted to 8 and the maximum path length is limited to 255 characters.

¹ actually you can try other resolutions as well, but then you are leaving the SVCD specification behind you...

² see <http://www.nocrew.org/?part=vcdpad>

³ 8 bytes for sub-header, 2324 bytes payload and finally 4 bytes for EDC

- File names must contain exactly one dot.⁴
- The path-name must not begin or end with a slash. Nor should it contain slashes following directly each other.

If the parent directory for a file entry does not exist it will be created automatically on demand.

2.1.3 CD-i Support

There is no specific CD-i support in GNU VCDImager. But you can use the general facilities for adding a custom CD-i player application.

If you happen to have a CD-i application consisting of the files ‘cdi_imag.rtf’, ‘cdi_text.fnt’, ‘cdi_vcd.app’ and ‘cdi_vcd.cfg’, with ‘cdi_vcd.app’ being the main application executable, you could add the following lines to your ‘~/popt’ popt⁵ aliasing file⁶

```
vcdimager alias --cdi \
--iso-application-id "CDI/CDI_VCD.APP;1" \
--add-file-2336 /usr/share/cdi/cdi_imag.rtf,CDI/CDI_IMAG.RTF \
--add-file      /usr/share/cdi/cdi_text.fnt,CDI/CDI_TEXT.FNT \
--add-file      /usr/share/cdi/cdi_vcd.app,CDI/CDI_VCD.APP \
--add-file      /usr/share/cdi/cdi_vcd.cfg,CDI/CDI_VCD.CFG
```

2.2 ‘vcdrip’ Tool

The ‘vcdrip’ utility offers just a few command line options:

```
$ vcdrip --help
Usage: vcdrip [OPTION...]
  -b, --bin-file=FILE      set image file as source
  --sector-2336            use 2336 byte sector mode for image file
  --cdrom-device=DEVICE    set CDROM device as source (Linux only)
  -d, --dump               dump information about VideoCD
  --rip                   rip mpeg tracks
  --rip-spi               rip segment play items
  -v, --verbose            be verbose
  -q, --quiet              show only critical messages
  -V, --version            display version and copyright information
                           and exit

Help options:
  -?, --help              Show this help message
  --usage                 Display brief usage message

$
```

⁴ if no file name extension is supposed to exist the dot must be placed as a trailing dot.

⁵ see documentation for popt for more information about option aliasing

⁶ add it to ‘/etc/popt’ if the setting should be available system-wide

3 Examples

3.1 Simple Multitrack Example

In the following example session, the files ‘track1.mpg’, ‘track2.mpg’ and ‘track3.mpg’ are mastered into the default output files ‘videocd.cue’ and ‘videocd.bin’. The volume label is set to ‘My Test VCD’.

```
$ vcdimager --iso-volume-label="My Test VCD" track1.mpg track2 track3.mpg
finished ok, image created with 13421 sectors (31566192 bytes)
$
```

3.2 MPEG Extraction

The next example show how to extract the MPEG streams contained in the image file ‘test.bin’ (the resulting streams are stored in files named ‘track_##.mpg’ with ‘##’ being the track number, starting with 0).

```
$ vcdrip-devel -v --rip --bin-file=test.bin
--DEBUG: found ENTRIES.VCD/SVD
      INFO: track_00.mpg: 1262 -> 2555
--DEBUG:  stream leadin at 1292
--DEBUG:  stream leadout at 2360
      INFO: track_01.mpg: 2555 -> 101705
--DEBUG:  stream leadin at 2585
--DEBUG:  stream leadout at 101510
      INFO: track_02.mpg: 101705 -> 200994
--DEBUG:  stream leadin at 101735
--DEBUG:  stream leadout at 200799
      INFO: track_03.mpg: 200994 -> 300041
--DEBUG:  stream leadin at 201024
--DEBUG:  stream leadout at 299996
$
```

Appendix A Acronym Expansions

CBR	constant bit rate
CD	compact disc
CD-DA	CD digital audio
CD-ROM	CD read only memory
DVD	digital versatile/video disc
FSF	free software foundation, http://www.fsf.org/
GNU	GNU is not UNIX, http://www.gnu.org/
MPEG	movie picture experts group
OGT	overlay graphics & text
PBC	playback control
PVD	primary volume descriptor
SVCD	Super VCD
VBR	variable bit rate
VCD	Video CD
XSVCD	eXtended SVCD
XVCD	eXtended VCD