

VideoCD Audio + Stills

A solution compatible with DVD players

1. INTRODUCTION

This manual is a translation into English from the original Spanish document available in www.videoedicion.org and www.vcdsp.com, firstly published on June-2002.

The procedure described in this manual is a modification from the one entitled **VideoCD Audio: an alternative to MP3 CD compatible with DVD players**, also available in Spanish in the quoted web. In that manual it was explained how to make a non-standard VCD with many hours of music, up to 99 themes directly reachable through menus, that could be played in many DVD. During the music reproduction the TV screen appeared in black (no image).

The main feature added here consists in the possibility of associating a still picture to each music theme (or if you prefer, a music theme to each picture ;-). This will require more place in the CD so that there will be less room available for music, but it will allow you to display on the TV the scanned original CD cover, or any text or image you want, while listening to music.

Anyway, the goal is to put several hours of music time in a single CD (**from 3,5 up to 6 hours in an 80 minutes CD-R**) compatible with (almost) any DVD player.

This new method can be seen as **the optimisation, for music and stills storage, of the non-standard VCD format called CVCD**. When DVD movies are backed to CD you need to store a lot of video information and a comparatively smaller part of audio data. Here it is found just the opposite situation, we need to store mainly audio information and only a small part of video (pictures).

About CVCD (Compact VideoCD) a lot of literature can be found through Internet, for example in the quoted www.videoedicion.org or in www.vcdsp.com.

There are other alternatives to the one proposed in this paper. Some of them are much more efficient if you take into account only the size of the .MPG files. Here, the target has been to tune a simple, flexible and very compatible method.

2. STEPS AND TOOLS FOR VIDEOCD AUDIO + STILLS AUTHORIZING

Steps followed and tools used to put into practice the here-described procedure are summarised in the next table.

Step	Program	Web	
1 ^a	Compilation of graphic files with pictures to be associated to each music track	Any drawing software	
2 ^a	Audio ripping from CD-DA and volume normalisation	CDex 1.40b9	www.cdex.n3.org
3 ^a	Audio (.WAV) and still (.BMP) files encoding for generation of .MPG files	TMPGEnc 2.53 Plus	www.tmpgenc.net
4 ^a	Menu design and CD-R/RW writing	Nero 5.5.7.8	www.nero.com

1st Step

In this method, for each music track in the VideoCD, a graphic file with the picture to be displayed is used as video source. A WAV file is used as audio source.

Due to the wide variety of available software tools for graphic creation and edition, some even included in Windows, we will not go into details about this subject. It will be assumed that the files are already ready, **in BMP format with 352x288-pixel and 24-bit colour deep**, if possible.

It is not mandatory to follow strictly this format specification, but it is useful because it saves encoding time. Anyway, several tips should be taken into account:

- If pictures with black strips, horizontal (352xN-pixels, N<288) or vertical (Mx288-pixel, M<352), are used than a lot of video bitrate can be saved.
- For the same quality grade, simple pictures (flat backgrounds, one-colour texts, few details...) need much less bitrate than complex pictures (many details, degraded textures...).

Depending on the picture and parameters values set for MPG files generation, the video part of the stream MPG could require from 75 up to 250 kbps (kilobits per second).

2nd Step

Music files must have the same WAV format than used by CD-DA (PCM, 2 stereo-channels, 16 bits per sample, 44.1 kHz sampling frequency).

The best option is to rip the WAV files directly from a CD-DA (CD-Digital Audio). At this step, like in the first one, many (free) tools are available and we will not go into details about this point. Only a few tips:

- **Normalise audio level for each theme** in order to avoid some of them to sound loud and others low.
- **Avoid using MP3 files as audio source.** Although it is possible to do it, MP3 is a loosely compression and if you decode en MP3 file to re-encode it in MP2, also a loosely compression system, strange sound artefacts could be heard.
- It is very useful **to assign to each file of a picture + sound couple the same name**, differing only in the tag, BMP for the picture file and WAV for the sound one.

3rd Step

MPEG files generation is the kernel of the procedure. The target of the following pages of this manual is to explain in deep the configuration of the encoding program used, TMPGEnc 2.53 Plus. Also some tips and tricks, and other options and some more technical aspects will be analysed.

For task automation, in particular for batch encoding of files, the referred document **VideoCD Audio: an alternative to MP3 CD compatible with DVD players** should be read.

4th Step

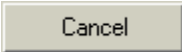
Menu generation, if wanted for easier track selection, and VCD-A recording are both tasks made with Nero. They are carried out following the described procedures in the reference manual. They will not be explained here again.

3. GENERATION OF MPG FILES

Once every pictures and music files are ready, the program TMPGEnc let you generate the MPG files to be recorded in the VCD. The procedure is as follows.

3.1 Start TMPGEnc

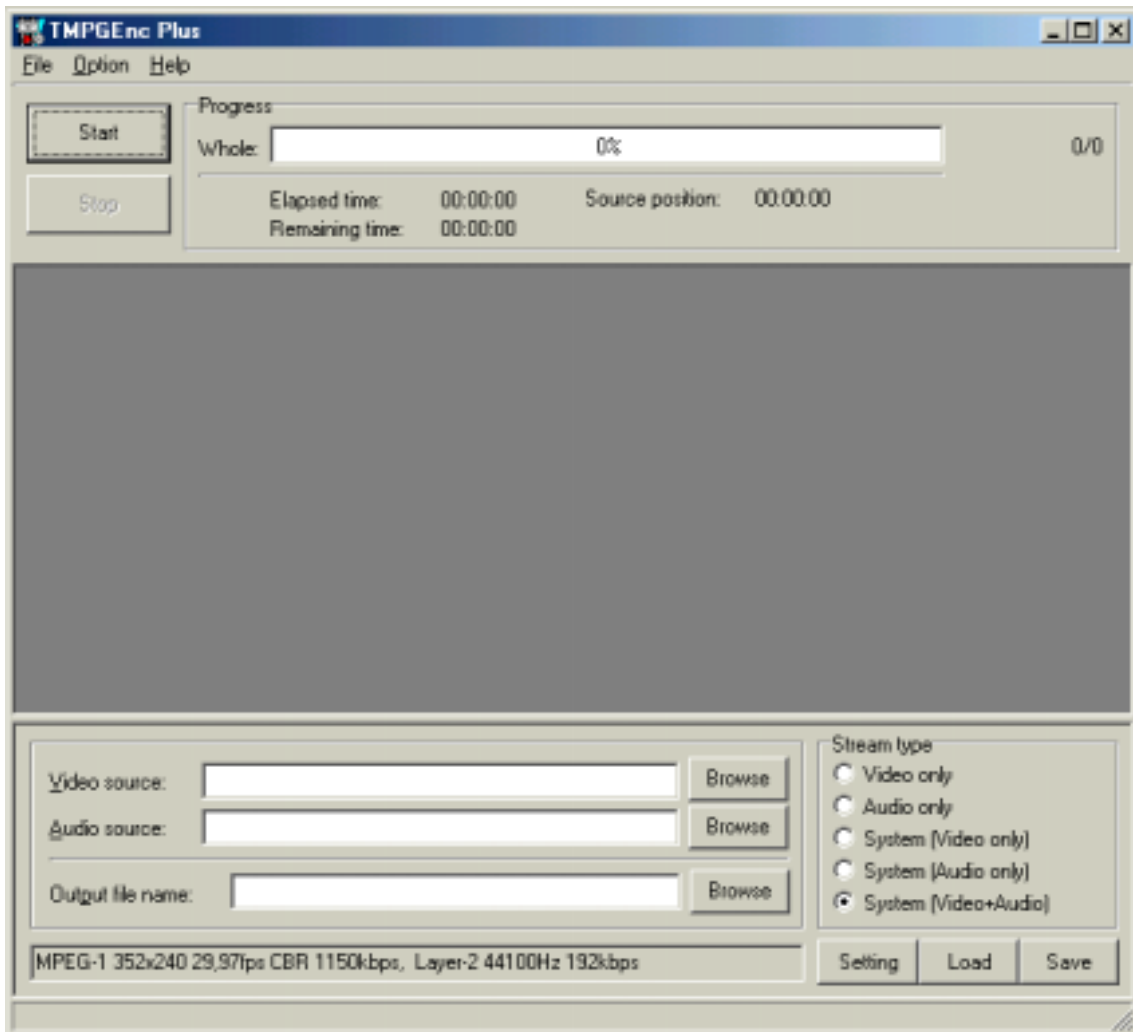
Start TMPGEnc with a double click on program icon, if there exists, or directly over TMPGEnc.exe file.

If window **Project Wizard** opens then close it with a click on button 

The main TMPGEnc window appears and several parameters must be configured.

The whole configuration procedure can be automated by using a template, but here it will be done step by step in order to understand better what and why to do. When configuration is finished, it can be saved for next time use.

Tip: just after loading a template file, it is worth to have a look to every parameter setting.

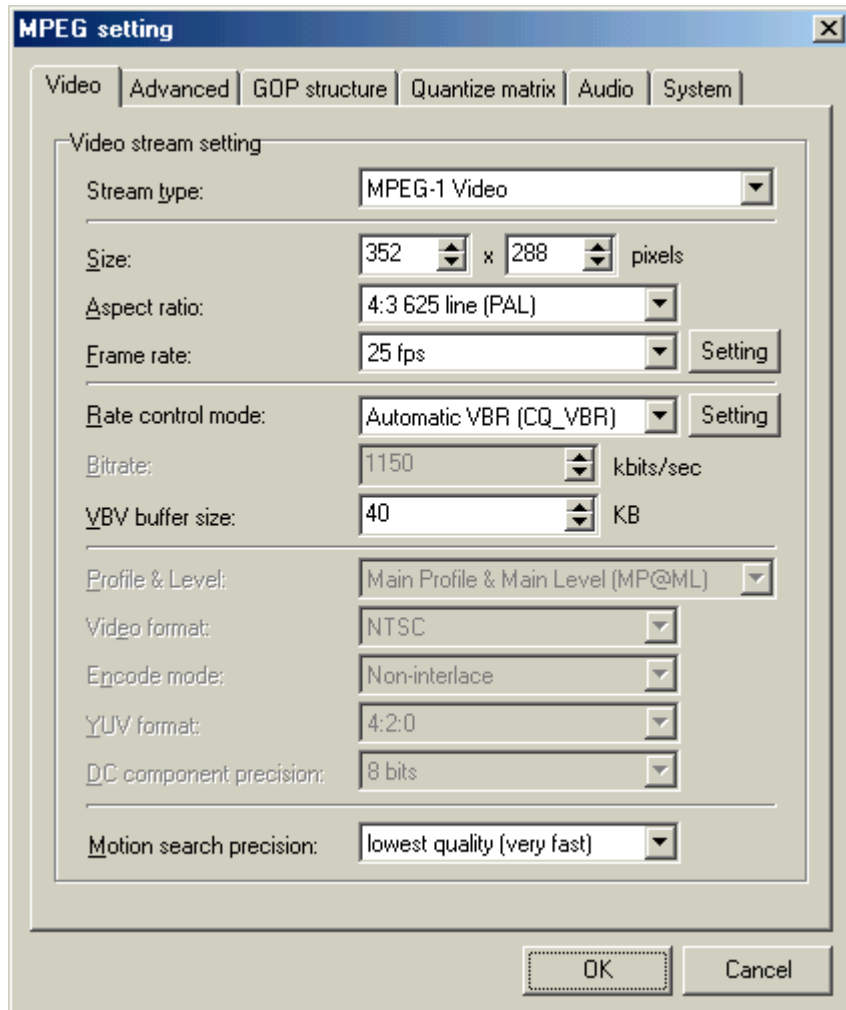


To start configuration click on button 

The window **MPEG setting** will appear. It has six thumb indexes, each one containing several fields.

3.2 TMPGEnc configuration: Video

In this window recommended video stream settings are shown.

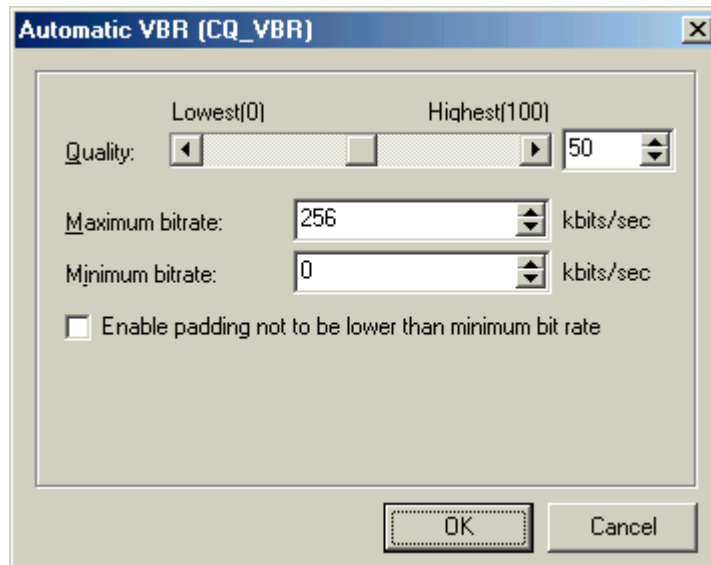


Size image, 352 x 288, **Aspect ratio** and **Frame rate** are set according to PAL colour TV standard used in Spain.

VBV buffer size has been tested that very good results are found if value 40 is assigned. Music sounds perfectly well, without any skips, in more DVD player models.

Motion search precision has been configured to value **lowest quality (very fast)** because, while working with still pictures, there is no need to look for motion so that encoding is faster.

For the field **Rate control mode**, the value **Automatic VBR (CQ_VBR)** has been selected. This requires to click on button to configure additional related parameters, quality level and maximum and minimum video stream bitrate, that appear in the following window.



In practice, for the field **Quality** the value 50 is good enough, while working with stills.

Maximum bitrate has been fixed to 256 kbps, but in part arbitrarily and in part due to experience. TMPGEnc will do full use of these 256 kbps only with complex pictures.

Other values can be used. For example, if the best picture quality is to be guaranteed, then 1.150 kbps can be used. But if a low video bitrate is mandatory then it is better to select 160 kbps. TMPGEnc will use only the bitrate needed for the quality level selected. It takes into account also the maximum bitrate value set. In practice most of pictures will require less than 256 kbps, although a higher limit is selected. Differences will not be found either in the size or in the quality of the resulting file.

Constant bitrate CBR is another option to be taken into account for video encoding. But only in a couple of cases:

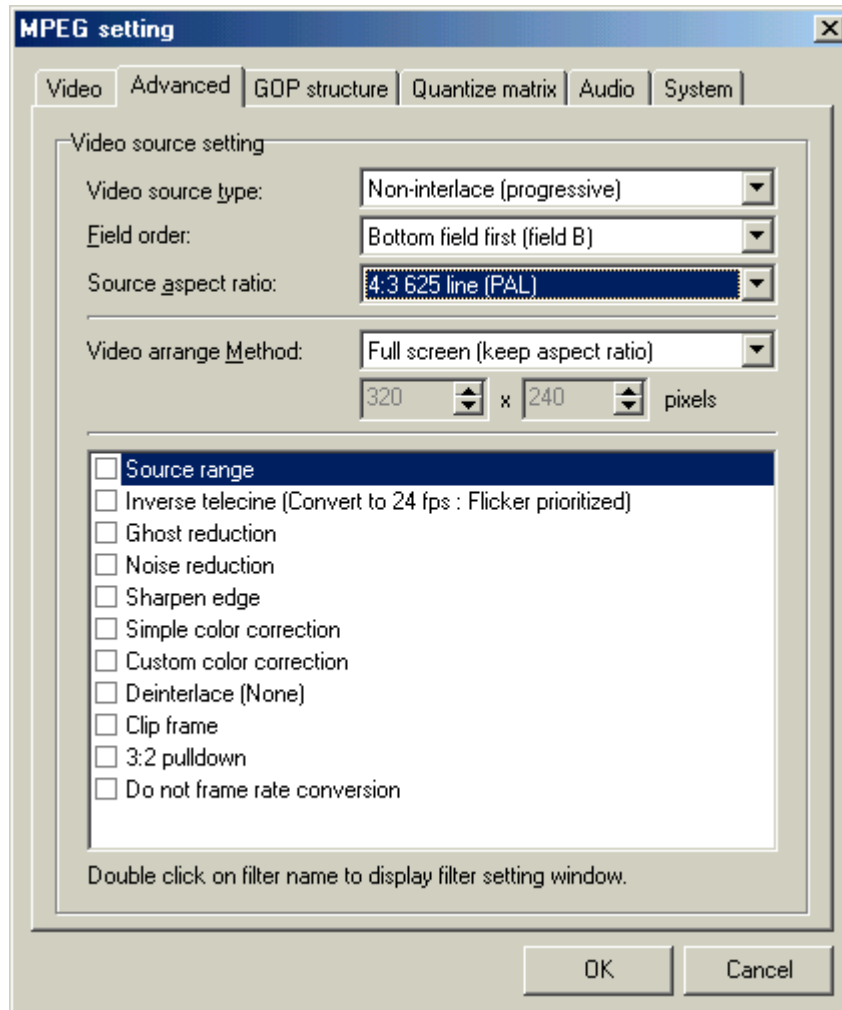
- If it is mandatory to know in advance the size of resulting MPG file.
- If the DVD player has problems to play VBR MPEG1 video streams.

Applying VBR gets the most efficient use of available bitrate.

3.3 TMPGEnc configuration: Advanced

In this window it is important the mixture of values selected for the fields **Source aspect ratio** (4:3 625 line - PAL) and **Video Arrange Method** (Full screen - keep aspect ratio) because they allow you to snap pictures in the TV screen without introducing aspect ratio distortion. If used pictures do not keep the 352 x 288 pixel ratio then horizontal or vertical black strips will appear on the TV screen.

It is also convenient to disable every filter for a faster encoding.



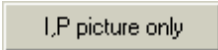
3.4 TMPGEnc configuration: GOP

Here we find a parameter, **GOP (Group Of Pictures)**, that is very important in order to reach our target in a very efficient way.

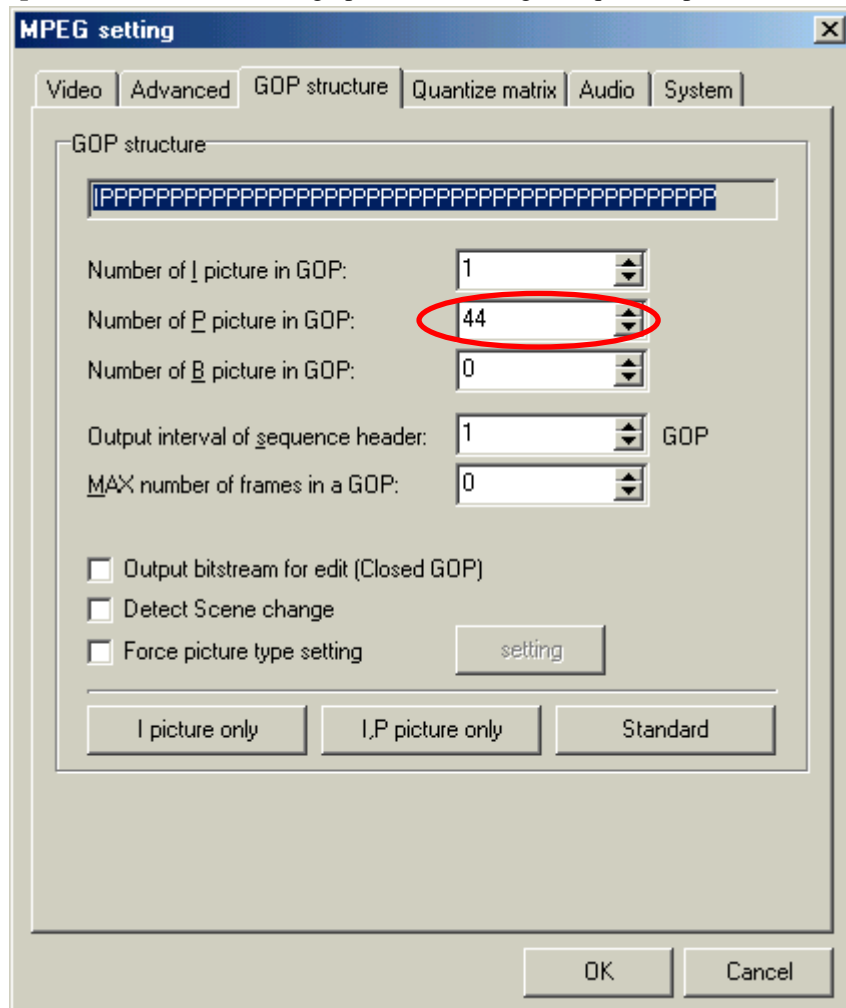
Although in deep MPEG video compression characteristics will not be explained here, it must be told that, when encoding a still as a video stream, the lower I-pictures are used, the lower video stream bitrate will result. Without any quality loses. This is the reason why **optimum GOP structure for stills encoding is of kind I+nP, where I represents an I-picture, and nP, n P-pictures.**

The higher the value of n is the lower the number of I-pictures in the MPG file goes. Each I-picture has a JPEG encoded image. It is independent of information displayed in previous or following pictures. P-picture needs lesser bits that I-picture because P-picture contains only differences with regard to previous pictures. In theory, P-picture requires no bit if used for stills encoding.

As explained in the guides available in www.videoedicion.org, GOP structure must not be over either **15 pictures for a DVD**, or **45 pictures for a CVCD**. But it has been tested in several DVD players that GOP structures like I+127P (and even bigger) works well. Besides, they produce, such as expected, lower bitrate video streams. For values greater than 127, encoding time rise a lot, but resulting file size changes very little.

Anyway as, from a theoretical point of view, the most compatible GOP structure is **I+44P**, it will be used in this guide. To set this value click on button  and type 44 in the field

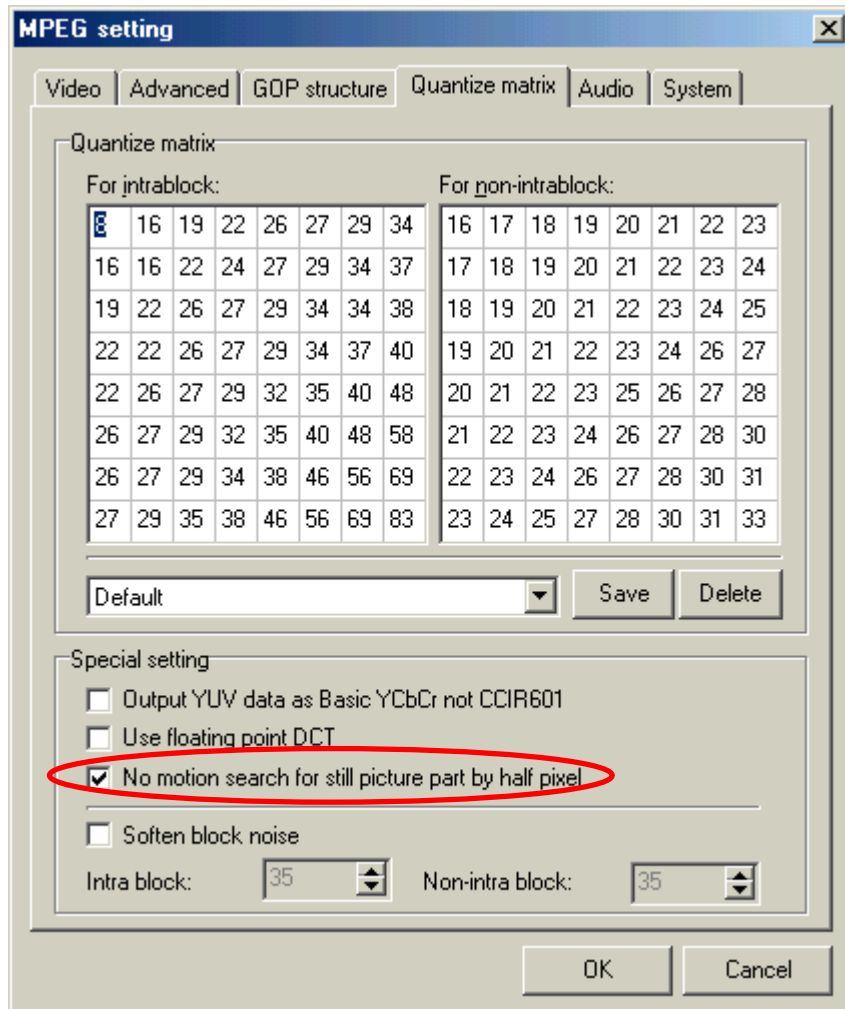
Number of P picture in GOP. Remaining options are set to get as quick as possible encoding.



3.5 TMPGEnc configuration: Quantize matrix

For **Quantize matrix**, option **Default** works very well for most of pictures. But if the picture is very simple, for example with single colour background and characters, then it could be more efficient, from the point of view of video stream bitrate, to choose the option **CG/Animation**.

It is convenient to disable every **Special Setting**, unless **No motion search for still picture part by half pixel** because, what to search for motion if we have only a still picture?.



3.6 TMPGEnc configuration: Audio

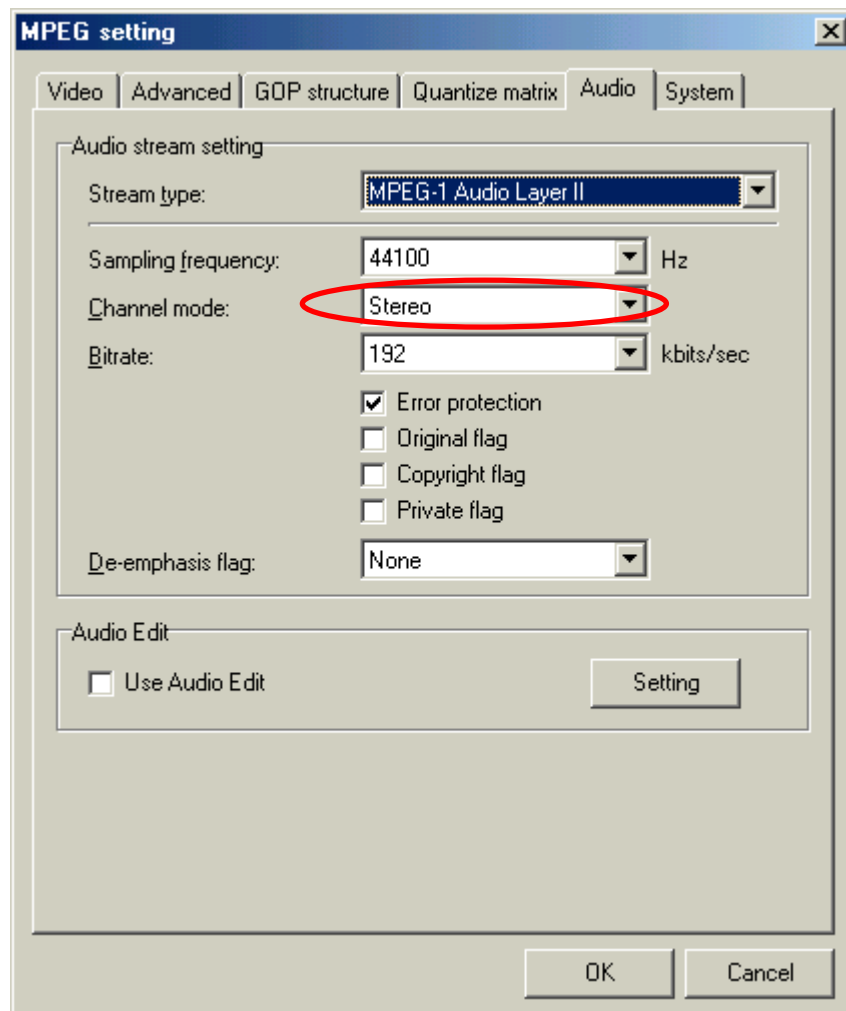
This is one of the most important windows. Select for the field **Channel mode** the option **Stereo**. Problems were found with some DVD players if option **Joint-stereo** is chosen.

Value selected for the field **Bitrate** depends mainly on total playing time and on CD size. It is a matter of working out total file size, without losing the 99 tracks per VCD limit. Do not forget that video for still pictures will need a quite important part of the CD. Note that audio uses only CBR (constant bitrate).

My own experience is that CVCD movies sound quite well with 128 kbps audio. At 160 kbps the music sounds very good. At 192 kbps (as selected here) it is difficult to distinguish between the original and the compressed music. At 224 kbps, it sounds like the original CD-DA. But this is only a matter of taste (and personal ear sensitivity :-)

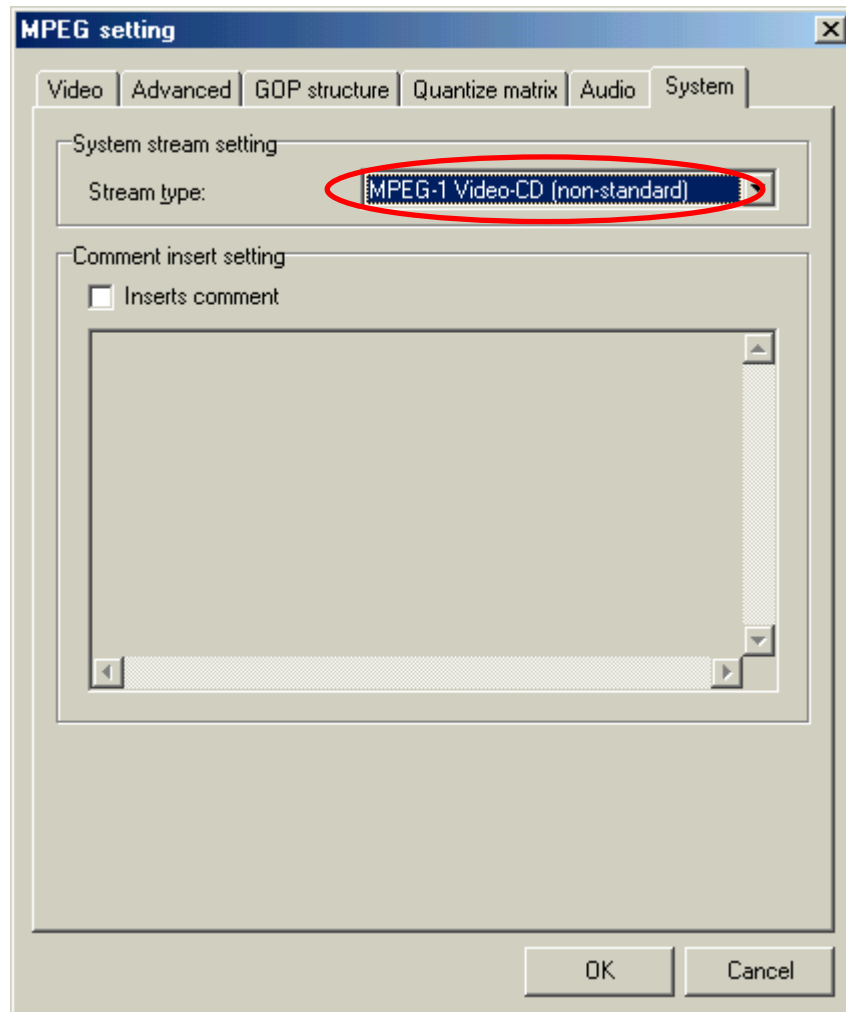
Some tips to be taken into account:

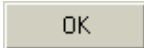
- It is possible to use different audio bitrates for different tracks in the same VCD. Compare and make your own selection.
- If compatibility problems are found when playing the VCD on the DVD, then test 224 kbps.

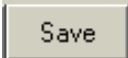


3.7 TMPGEnc configuration: System

Here, the main point is to select for the field **Stream type** the option **MPEG-1 Video-CD (no-standard)**.




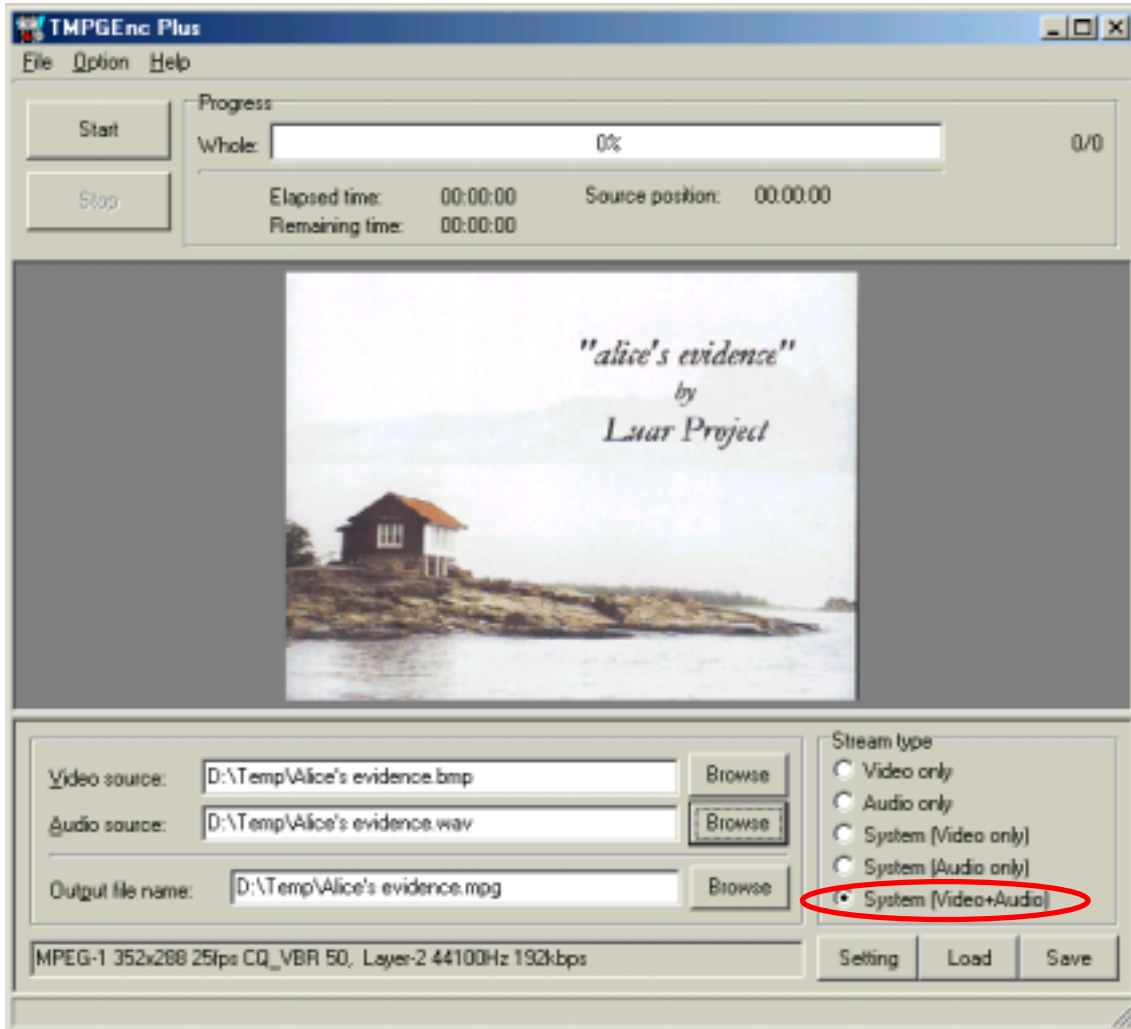
Now, after clicking on button  you go back to TMPGEnc main screen, as seen in 3.1


At this point, if the configuration process is being carried out for the first time, you should click on button  **to save the present adjusts in a template file.**

The next step is to select the audio files to encode.

3.8 Selection of files to encode

Click on button  of the fields **Video source** and **Audio source** to look for the BMP and WAV file couple to be used to generate the first of the MPG files to be recorded in the VCD.



If you want to start encoding immediately you can click on button  but in general it is more convenient to configure TMPGEnc for several files batch processing.

The following points are identical to the ones described in the quoted guide **VideoCD Audio: an alternative to MP3 CD compatible with DVD players** and they will not be repeated here:

- How to configure TMPGEnc batch encoding.
- How to record VCD with menus with Nero.
- User's guide and trouble shooting
- VCD related links.

4. SUMMARY

This paper describes a quite simple and flexible solution for recording several hours of high quality compressed music with stills in a VCD that can be played in many DVD.

The main advantages of the proposed method are:

- Each theme can be encoded and stored separately.
- VCD-A structure modification does not require to re-encode every MPG file. Only the new ones.
- One single VideoCD can include files encoded in different ways (with different encoder configuration parameter values).
- There is total freedom for pictures designing.

© Written and translated by Paco Moreno ([fmoreno\[no_spam\]@terra.es](mailto:fmoreno[no_spam]@terra.es))

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