HCenc – MPEG2 encoder

Release HCenc026

General information

- ***What is HCenc***
  HCenc is a simple to use MPEG2 video encoder and is meant for creating MPEG2 video streams with a strong focus on DVD and Blu ray (BD) compliancy.
  All MPEG2 SD / HD resolutions are supported, maximum resolution: 1920 x 1152.

- ***Installation***
  Just unzip the archive where you have a few GB free space, the space is needed for the storage of intermediate files.

- ***Hardware requirements***
  The encoder will run on any Intel and AMD processor using Windows 2000/XP/Vista/Win7.
  It will probably run under Linux (using Wine) and older Windows versions.
  HCenc uses the next CPU extensions if available: MMX/SSE, SSE2, SSE3, SSSE3, at least MMX/ISSE must be present, if SSE2, SSE3 or SSSE3 is present HC will also use it, run time will be 5 - 10% faster with SSE2 and 5 – 30% with SSE3 or SSSE3. The encoder will automatically detect the CPU extensions.
  Memory requirements: HCenc will run with only 256 MB installed, more is, as always, better.
  For HD encodes 2 GB is recommended.
  HCenc 026 is a multi-threaded application, it's also possible to run multiple instances of HCenc.

- ***Input***
  Input can be a DGIndex/DGDecode d2v project or input using Avisynth.
  HCenc expects as input plane YV12 4:2:0 or packed YUY2 4:2:2.

- ***Versions***
  Two versions are available, a GUI version (HCgui) which is easy to use and the actual encoder (HCenc) which is controlled by a serie of commands in an ini file, it can also take parameters.
  The GUI version will only generate the ini file, it uses HCenc to do the actual encoding.
  If you have a CPU which can do SSE4 you can use the Hcenc_026_SSE4.exe version.
  It is slightly faster, the easiest way is to simply delete Hcenc_026.exe and rename Hcenc_026_SSE4.exe to Hcenc_026.exe.

- ***Output***
  Output is a regular m2v file which can be used directly in your favorite authoring program.

Features

- ***1pass/multipass***
  HCenc is a 1 or 2 pass encoder which produces a VBR MPEG2 stream.
  Bitrate control is controlled by an average bitrate value and a maximum bitrate value.

- ***Bitrate control***
  Bitrate is controlled by two commands: *BITRATE and *MAXBITRATE.
  Buffer underflows will never occur, while encoding the frames, the VBV (Video Buffer Verifier) is constantly checked for buffer underruns, if buffer underruns occur the bit stream will be adapted so the stream will always be DVD-compliant.

- ***Encoding quality***
  Encoding quality is controlled by the encoding profile: FAST, NORMAL, BEST.
  For the *PROFILE command, see the command section.

- ***GOP structure***
  User controllable, maximum GOP length is 36, maximum consecutive B-pictures is 3.
  You can for instance give the command *GOP 15 2 or *GOP 12 1, see the command section.
  If the *GOP command is omitted, HCenc wil run in AUTOGOP mode, this probably is the best way to run the encoder. In AUTOGOP mode HCenc scans frames to be encoded and measures the activity of the frames. Based on the activity of the frames HC tries to create an optimal GOP structure.
  A sequence header is written for each GOP.

- ***Scene change detection***
  HCenc has a scene change detection algorithm built in, on each scene detection an I-frame is inserted and the GOP will be closed so you can cut the video at each scene change.
  If necessary the frames in the two previous GOP's will be redistributed to maintain a nice general GOP structure.

- ***Quantization matrices***
  You can use any matrix you like, some well known matrices are already built in which can be activated by the *MATRIX command. If you want to use your own matrix (intra and non-intra) just use the command *CUSTOMMATRIX and specify the two matrices, see the command section.
  If the *MATRIX command is omitted HCenc will use the standard “adapted” MPEG matrices, see the matrix section for the matrix specification.

- ***Progressive/interlaced encoding***
  HCenc 026 has an auto-detect mode which will choose the optimal encoding method for each frame (progressive vs interlaced), of course it can be forced to do progressive or interlaced only.

- ***Encoding speed***
  Encoding speed is highly dependent of:
  - Complexity and resolution of the video material
  - Speed of your system: CPU, cache size and bus/memory speed
  - Availability of CPU extensions

  Encoding (interlaced) DV video might take longer to encode.
  A fast system will encode a 3 hour movie (DVD backup) in approx. 1 hour with *PROFILE BEST.

Command section

HCenc is controlled by a series of commands in the ini file.
It can also use parameters, see the next section.

Commands may be given in any order, they all start with *, commands may be uppercase or lowercase and must start at the first column.

You can simply deactivate a command by putting a space before the command.

NOTE ABOUT INTERLACED ENCODING
There are 3 commands to control interlaced encoding: *PROGRESSIVE, *INTERLACED and *DVSOURCE.
If none of these commands are used it runs in auto detect mode with TFF.

The next commands are available:

***1PASS**

parameter	-	***type***	-
Status	not required		
Default	-		
Example	*1PASS		

This command activates the 1 pass VBR (Variable Bit Rate) mode. An average bit rate can be set. A fast sampling pass will be done before the actual encoding pass. The output file size can be off if the encoded clip is short, it will be disabled if the nr. of frames < 1000.

***ADAPTIVEMATRIX**

parameter	-	***type***	-
Status	not required		
Default	-		
Example	*ADAPTIVEMATRIX		

This command activates the code in matrix.dll. Using this command you can change matrices at every GOP. **This is meant for very experienced users only !!**
See the adaptive matrices section in this manual how to create the dll.

***AQ**

parameter	strength (0 - 4)	***type***	integer
Status	not required		
Default	2		
Example	*AQ 3		

This command activates adaptive quantization, flat parts are given a lower quantizer.
Strength 0 means no adaptive quantization, strength 4 generates the lowest quants for flat parts but it may create artifacts around sharp edges.
HCEnc 026 will use AQ 2 as default.

***ASPECT**

parameter	1:1, 4:3, 16:9, 2.21:1	***type***	character string
Status	not required		
Default	16:9		
Example	*ASPECT 4:3 (3:4 is also allowed)		

This command sets the desired aspect ratio.

***AUTOGOP**

parameter	goplength (8 – 18)	***type***	integer
Status	not required		
Default	15 (12 for 23.976 fps)		
Example	*AUTOGOP 12		

This command sets the maximum GOP length to be used by the autogop algorithm.
Running in AUTOGOP mode means the encoder tries to distribute the I, P and B frames in an optimal manner based on the activity of the frames.
Encoding using AUTOGOP will be DVD-compliant if the next values are used:

- For NTSC source to be pulldowned, use values 12 – 14.
- For PAL source a maximum value of 15 should be used.
- For 29.97 NTSC source the maximum of 18 can be used.

***AVSMEMORY**

parameter	memory	***type***	integer
Status	not required		
Default	-		
Example	*AVSMEMORY 32		

This command sets the maximum memory (MB) to be used by Avisynth, maximum value: 1024.
This command is equivalent to the SetMemoryMax() Avisynth command.

***B3**

parameter	-	***type***	-
Status	not required		
Default	-		
Example	*B3		

This command allows 3 consecutive B-frames, NOT DVD-COMPLIANT.

***BFF**

parameter	-	***type***	-
Status	not required		
Default	NA for progressive, TFF for interlaced, BFF for DV source		
Example	*BFF		

This command specifies bottom field first, only used for interlaced encoding.

***BIAS**

parameter	bias (range 0 – 100)	***type***	integer
Status	not required		
Default	0		
Example	*BIAS 30		

This command tweaks the compression curve, 0 means full VBR (Variable BitRate), 100 tends to CBR (Constant BitRate).

***BITRATE**

parameter	bitrate	***type***	integer
Status	required		
Default	-		
Example	*BITRATE 3250		

This command specifies the average bitrate per second in kbits/s. (1 kbit = 1000 bit)

***CHAPTER**

parameter	nr. of chapters	***type***	integer
Status	not required		
Default	-		
Example	*CHAPTER 5 101 1253 2763 5471 8354		

This command sets chapter points at the frames given, this means an I-frame is inserted and the GOP is closed.
There's no limit on the number of chapters, you can even set a chapter on every frame.

***CHROMADOWNSAMPLE**

parameter	method, 0=progressive, 1=interlaced	***type***	integer
Status	not required		
Default	0		
Example	*CHROMADOWNSAMPLE 1		

This command down samples 4:2:2 input to 4:2:0 color space using progressive or interlaced sampling. CHROMADOWNSAMPLE 0 (progressive) is set by default.

***CHROMAFORMAT**

parameter 420, 422 (4:2:0, 4:2:2) ***type*** character string
Status not required
Default 420
Example *CHROMAFORMAT 422
This command sets the chroma output format, for 422 output YUY2 input is needed, 420 output takes YV12 or YUY2 input.
YUY2 will be down sampled using progressive or interlaced downsampling.

***CLOSEDGOPS**

parameter - ***type*** -
Status not required
Default -
Example *CLOSEDGOPS
This command closes all gops.
CLOSEDGOPS is disabled by default.

***COLOUR**

parameter colorimetry ***type*** integer
Status not required
Default -
Example *COLOUR 5
This command flags the colorimetry of the stream by outputting the Sequence Display Extension header. For playback this header is ignored (Rec.601 will always be used for SD color conversion, Rec.709 for HD color conversion) but it's useful for MPEG2 compliancy.
Possible settings: 1: BT.709, 4: BT.470-2M, 5: BT.470-2BG, 6: SMPTE170M, 7: SMPTE240M.
By default this header is not written.

***CPU**

parameters AUTO, MMX, SSE2, SSE3 , SSSE3 ***type*** character string
Status not required
Default AUTO
Example *CPU MMX
This command can be used to force the cpu to use specific extensions.

***CQ**

parameter quantization ***type*** real
Status not required
Default -
Example *CQ 5.8
This command orders the encoder to do a 1-pass with a constant quantization factor.
The value for quantization is the non-linear scale value.
No database is created, the output file is created in the first pass.
NOTE: this is not the same as CBR encoding, HCenc doesn't do CBR encoding.

***CQ_BFACTOR**

parameter factor for B-frame quantization ***type*** real
Status not required
Default 1.0
Example *CQ_BFACTOR 1.4
Multiplication factor for the quantization of B-frames using constant quantization.
Range: 0.5 – 4.0.
Example: if *CQ or *CQ_MAXBITRATE is set to 5, using *CQ_BFACTOR 1.4 means B-frames will use Q = 7.

***CQ_MAXBITRATE**

parameter quantization ***type*** real
Status not required
Default -
Example *CQ_MAXBITRATE 5.8
This command orders the encoder to do a 1-pass with a constant quantization factor.
If the actual bitrate overshoots the maximum bitrate set by the *MAXBITRATE command the quantizer is temporally raised. Output will be DVD-compliant.
The value for quantization is the non-linear scale value.
No database is created, the output file is created in the first pass.
NOTE: this is not the same as CBR encoding, HCenc doesn't do CBR encoding.

***CQ_PFACTOR**

parameter factor for P-frame quantization ***type*** real
Status not required
Default 1.0
Example *CQ_PFACTOR 1.2
Multiplication factor for the quantization of P-frames using constant quantization.
Range: 0.5 – 4.0.
Example: if *CQ or *CQ_MAXBITRATE is set to 5, using *CQ_PFACTOR 1.2 means P-frames will use Q = 6.

***CUSTOMMATRIX**

parameter - ***type*** -
Status not required
Default -
Example *CUSTOMMATRIX

```
 8 16 19 22 26 27 29 34
16 16 22 24 27 29 34 37
19 22 26 27 29 34 34 38
22 22 26 27 29 34 37 40
22 26 27 29 32 35 40 48
26 27 29 32 35 40 48 58
26 27 29 34 38 46 56 69
27 29 35 38 46 56 69 83

16 17 18 19 20 21 22 23
17 18 19 20 21 22 23 24
18 19 20 21 22 23 24 25
19 20 21 22 23 24 26 27
20 21 22 23 25 26 27 28
21 22 23 24 26 27 28 30
22 23 24 26 27 28 30 31
23 24 25 27 28 30 31 33
```

This command defines custom intra and non-intramatrices to be used and supersedes the default matrix and the *MATRIX command.
The matrices must be supplied as given in the example, 8 values per line.

***DBPATH**

parameter path ***type*** character string
Status not required
Default -
Example *DBPATH E:\tmp
This command sets the path for the intermediate database file.

***DC_PREC**

parameter dc_precision ***type*** integer
Status not required
Default 9
Example *DC_PREC 8
This command defines the DC_precision to be used, range 8 - 11.
NOTE: dc_precision 11 is NOT DVD-compliant.

***DEADZONE**

parameter intra inter ***type*** 2*integer
Status not required
Default -
Example *DEADZONE 3 2
This command defines the dead zone values used for intra and non-intra (inter) quantization.
It acts as a frequency domain low pass filter. If this command is not given, it will run in automatic mode, source dependent. If you want to disable dead zone quantization, use *DEADZONE 0 0.
Range for the intra and inter parameters: 0 – 6.

***DVSOURCE**

parameter - ***type*** -
Status not required
Default -
Example *DVSOURCE
This command sets the correct parameters for (interlaced) DV sources, the source is assumed to be pure interlaced, also the BFF flag is set.
If this command is used also the alternate scanmethod is set.

***FRAMELOG**

parameter psnr ***type*** character string
Status not required
Default -
Example *FRAMELOG
Use this command to write a file with encoding information per frame.
If the parameter psnr is present the PSNR and average PSNR are written in the framelog file.
This file (framelog.txt) is written in the output file directory.

***FRAMES**

parameters startframe endframe ***type*** (2X) integer
Status not required
Default -
Example *FRAMES 0 499
This command specifies the frames to be encoded, if this command is not present all frames will be encoded. The example will encode the first 500 frames.

***GOP**

parameters goplength B-frames ***type*** (2X) integer
Status not required
Default -
Example *GOP 12 2
This command defines the GOP structure.
Max. GOP length is 36, max. B-frames is 3. 3 B-frames is NOT DVD-compliant, you also have to give the *B3 command to force the use of 3 B-frames.
If this command is omitted, HC wil run in AUTOGOP mode.

***INFILE**

parameter input file name ***type*** character string
Status required
Default -
Example *INFILE D:\movies\ test.avs
This command defines the input filename. This file should be a d2v project or an Avisynth file, so the extension is d2v or avs.

***INTERLACED**

parameter - ***type*** -
Status not required
Default -
Example *INTERLACED
Use this command if your source is interlaced.
If this command is used also the alternate scan method is set.

***INTRAVLC**

parameter *method* ***type*** integer
Status not required
Default *2*
Example *INTRAVLC 1
This command sets the method for intra VLC coding, 0 uses table 14, 1 uses table 15, 2 optimizes the VLC coding.

***LASTIFRAME**

parameter - ***type*** -
Status not required
Default -
Example *LASTIFRAME
The last frame will be encoded as an I-frame.

***LLPATH**

parameter path ***type*** character string
Status not required
Default -
Example *LLPATH E:\tmp
This command sets the path for the intermediate lossless file.

***LOGFILE**

parameter log file name ***type*** character string
Status not required
Default -
Example *LOGFILE D:\movies\test.log
This command defines the log filename, if omitted no logfile will be written.
If the logfile already exists the logs will be appended.

***LOSSLESS**

parameter - ***type*** -
Status not required
Default -
Example *LOSSLESS
This command activates the use of a lossless intermediate file for 2 pass encoding.
It can only be used with Avisynth input, can be useful if the avs script is very slow, using lossless means the script has to be processed only once. This command can also be used if there are source mismatch errors which can't be solved with *AVSRELOAD.
WARNING, the lossless file can be huge.

***LUMGAIN**

parameter sensitivity (0 - 4) ***type*** integer
Status not required
Default 0
Example *LUMGAIN 2
This command adapts the quantization matrices on dark scenes so the bitrate will be raised.

- 0 no change
- 1 mild change
- 2 moderate change
- 3 heavy change
- 4 hit dark scenes real hard

CAUTION: although it is DVD compliant, it might not play correct on some HW players.

***MASK_SHIFT**

parameter top bottom shift ***type*** 3*integer
Status not required
Default 0 0 0
Example *MASK_SHIFT 16 144 64
This command masks top and bottom lines, the 3th parameter specifies the shift in lines, positive values will shift the video upwards, negative values will shift it down. All values must be even.
The example will mask 16 top lines and 144 bottom lines, the video is shifted upwards 64 lines.
The shift is done first, after that the top and bottom masking.

***MATRIX**

parameter matrix ***type*** character string
Status not required
Default MPEG matrix
Example *MATRIX HClow
This command defines the intra and non-intra matrix to use.
See the matrix section for available built-in matrices and the default matrix specification.

***MAXBITRATE**

parameter bitrate ***type*** integer
Status required
Default -
Example *MAXBITRATE 9000
This command specifies the maximum bitrate in kbits per second. (1 kbit = 1000 bit)

***MINBRFAC**

parameter *value* ***type*** real
Status not required
Default 1.00
Example *MINBRFAC 1.2
This command manipulates the lower limit for creating the compression curve for 2 pass encoding. Range for MINBRFAC: 0.5 – 2.0.
WARNING: small values may cause blocking.

***NOSEQ_ENDCODE**

parameter - ***type*** -
Status not required
Default -
Example *NOSEQ_ENDCODE
This command disables output of the sequence endcode (00 00 01 B7) at the end of the stream.

***NOSCD**

parameter - ***type*** -
Status not required
Default -
Example *NOSCD
This command disables the scene change detection.
Scene change detection is enabled by default, at each scene change an I-frame is inserted and the GOP is closed.

***NOSMP**

parameter - ***type*** -
Status not required
Default -
Example *NOSMP
HC will detect the nr. of processors on your system and will use multi-thread encoding if the nr. of processors > 1.
This command disables multi-thread encoding.

***NOVBV**

parameter - ***type*** -
Status not required
Default -
Example *NOVBV
This command disables the VBV (Video Buffer Verifier) checking.
VBV checking is enabled by default. This command should not be used for DVD creation.

***OUTFILE**

parameter output file name ***type*** character string
Status required
Default -
Example *OUTFILE D:\movies\test.m2v
This command defines the output filename, required.

***PANSCAN**

parameter	hordisp, vertdisp, nr. of frames	***type***	3*integer
Status	not required		
Default	-		
Example	*PANSCAN 540 576 3 900 1440 0 1200 -1440 0 1600 0 0		

This command defines the 4:3 panscan window. The active window is defined by hordisp (horizontal size) and vertdisp (vertical size). Additional frames can be input to define the horizontal and vertical shift, the shift is defined in pixel/16 values.
The example sets the normal 4:3 panscan (540*576 PAL), 3 frames with shifts are given.
The clip starts with zero shifts, from frame 900 the scan window is shifted 90 pixels to the right, from frame 1200 the scan window is set to 90 pixels to the left. From frame 1600 the display is centered. To use panscan, colorimetry (*COLOUR) must also be active, if colorimetry is not given, colour 5 (BT.470-2BG) is assumed.
Panscan will only work with 720/704 x 576/480 resolutions.

***PREVIEW**

parameter	-	***type***	-
Status	not required		
Default	-		
Example	*PREVIEW		

This command turns on the preview window in the encoder.

***PRIORITY**

parameter	IDLE, LOW, NORMAL, HIGH	***type***	character string
Status	not required		
Default	IDLE		
Example	*PRIORITY LOW		

This command sets the process priority.

***PROFILE**

parameter	FAST, NORMAL, BEST	***type***	character string
Status	not required		
Default	NORMAL		
Example	*PROFILE BEST		

This command defines the encoding quality. As usual the best encoding will take the most time.

***PROGRESSIVE**

parameter	-	***type***	-
Status	not required		
Default	-		
Example	*PROGRESSIVE		

Use this command if you're sure your source is progressive, all frames will be encoded progressive. If this command is used also the zigzag scanmethod is set.
This command will not set the progressive_sequence flag in the sequence extension header.

***PROG_SEQ**

parameter	-	***type***	-
Status	not required		
Default	-		
Example	*PROG_SEQ		

This command sets the progressive_sequence flag in the sequence extension header, this means the encoded stream contains only progressive frames. The *PROGRESSIVE command needs to be set also.

***PULLDOWN**

parameter - ***type*** -
Status not required
Default -
Example *PULLDOWN
This command sets pulldown flags for 23.976 → 29.97 pulldown.
Interlaced will be turned off, if your source is interlaced, please de-interlace it first.
If the source isn't 23.976 fps this setting will be ignored.

***SCDFILE**

parameter - ***type*** -
Status not required
Default -
Example *SILENT
This command writes the frames with a scene change in file <output>.scd.

***SHUTDOWN**

parameter - ***type*** integer
Status not required
Default -
Example *SHUTDOWN
This command will shutdown the system in 300 seconds after finishing encoding.

***SILENT**

parameter - ***type*** -
Status not required
Default -
Example *SILENT
This command disables the encoder GUI, background encode. It might have a marginal speed increase.

***SMP**

parameter - ***type*** -
Status not required
Default -
Example *SMP
HC will detect the nr. of processors on your system and will use multi-thread encoding if the nr. of processors > 1.
This command forces multi-thread encoding, even on single processor PC's.

***TFF**

parameter - ***type*** -
Status not required
Default NA for progressive, TFF for interlaced, BFF for DV source
Example *TFF
This command specifies top field first, only used for interlaced encoding.

***TIMECODE**

parameters hour minute second frame ***type*** (4X) integer
Status not required
Default 0 0 0 0
Example *TIMECODE 1 2 3 4
This command sets the timecode.

***WAIT**

parameter second ***type*** integer
Status not required
Default 5
Example *WAIT 0
This command sets the waiting time before HC exits after an encoding session, range 0 – 99.
If you have a lot of short encodes it's best set to *WAIT 0.

***ZONE**

parameter	nr. of zones	***type***	integer
Status	not required		
Default	-		
Example	*ZONE 3 1200 1.3 1500 1. 2700 0.5		

This command raises or lowers the bitrate for parts of the video.
The example will raise the bitrate starting at frame 1200, reset to normal at frame 1500 and lowers the bitrate starting at frame 2700.
The number of zones is limited to 6400.

Using parameters

The next commands with parameters can be passed:

command	parameter	info
-i	*inputfile*	full path
-o	*outputfile*	full path
-b	*bitrate*	kbit/s
-maxbitrate	*max.bitrate*	kbit/s
-minbrfac	factor	scale factor for minimum bitrate setting
-filesize	*filesize*	file size in kbyte
-frames	*startframe endframe*	frame range
-frames	*all*	encode all frames
-gop	*goplength B-frames*	GOP length and nr. of B-frames
-b3		allow 3 consecutive B-frames
-log	*logfile*	full path
-chapter	*chapterfile*	full path
-ini	*inifile*	full path
-profile	*fast, normal, best*	encoding quality
-aspectratio	*1:1, 4:3, 16:9, 2:21*	3:4, 9:16, 2.21:1 or 1:2.21 can also be used
-scene		enable scene change detection
-noscene		disable scene change detection
-interlaced		interlaced encoding, TFF flag set, alternate scan
-progressive		progressive encoding, zigzag scan
-dvsource		interlaced encoding, BFF flag set, alternate scan
-matrix	*mpeg, qlb ...*	use a built-in matrix, see the matrices section for the available matrices, default: mpeg matrix
-tff		set Top Field First
-bff		set Bottom Field First
-dc_prec	*8, 9, 10, 11*	dc precision, 11 is NOT DVD-compliant
-bias	*biasvalue*	0 – 100
-aq	*AQstrength*	Adaptive Quantization (default: strength=2)
-intravlc	*0, 1, 2*	0=table14, 1=table15, 2=auto (optimized)
-cq	*CQvalue*	constant quantizer, one pass
-cq_maxbitrate	*CQvalue*	constant quantizer respecting max bitrate and VBV, one pass
-cq_bfactor	*CQB-factor*	CQ factor for b-frames
-cq_pfactor	*CQP-factor*	CQ factor for p-frames
-pulldown		activate pulldown (only 23.796 --> 29.97)
-closedgops		close all GOPs
-priority	*idle, low, normal, high*	set priority
-smp		use multi threading
-nosmp		disable multi threading
-silent		background encoding, no HCenc gui
-wait	*seconds*	nr. of seconds before gui closes
-shutdown		shut down when encoding is finished
-noini		don't process the default HC.ini file
-1pass		do a 1 pass VBR encode
-2pass		always do a 2 pass encode, skip all CQ commands
-lossless		use a lossless file for 2 pass Avisynth encodes
-deadzone	*intravalue intervalue*	use deadzone quantization (zero values for disable)
-avsmemory	*memory*	sets the memory (MB) to be used by Avisynth

For a detailed description, see the command section.

If -noini isn't used, HCenc will always look if there's a HC.ini file in the same directory as the exe file and will also read values from it. Parameters passed have a higher priority than the values supplied in the ini file.
For batch processing you can do something like this:
HCenc_026 -i d:\movies\test1.avs -o d:\movies\test1.m2v -b 4000 -maxbitrate 9000 -ini d:\movies\hc.ini
HCenc_026 -i d:\movies\test2.d2v -o d:\movies\test2.m2v -b 3500 -maxbitrate 8000 -ini d:\movies\hc.ini

Input file, output file, bitrate and maxbitrate are set as parameter, rest of the commands are read from HC.ini.

Reading all from (different) ini files:
HCenc_026 -ini d:\movies\hc1.ini
HCenc_026 -ini d:\movies\hc2.ini

Matrices

The next built-in matrix will be used as default, the MPEG adapted matrix.
The intra matrix is the standard MPEG matrix and will not be written in the MPEG2 stream.

*MATRIX **MPEG**

8	**16**	**19**	**22**	**26**	**27**	**29**	**34**		**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
16	**16**	**22**	**24**	**27**	**29**	**34**	**37**		**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
19	**22**	**26**	**27**	**29**	**34**	**34**	**38**		**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
22	**22**	**26**	**27**	**29**	**34**	**37**	**40**		**19**	**20**	**21**	**22**	**23**	**24**	**26**	**27**
22	**26**	**27**	**29**	**32**	**35**	**40**	**48**		**20**	**21**	**22**	**23**	**25**	**26**	**27**	**28**
26	**27**	**29**	**32**	**35**	**40**	**48**	**58**		**21**	**22**	**23**	**24**	**26**	**27**	**28**	**30**
26	**27**	**29**	**34**	**38**	**46**	**56**	**69**		**22**	**23**	**24**	**26**	**27**	**28**	**30**	**31**
27	**29**	**35**	**38**	**46**	**56**	**69**	**83**		**23**	**24**	**25**	**27**	**28**	**30**	**31**	**33**

The next built-in matrix can be used with the *MATRIX command , the MPEG standard matrix.
The intra and inter matrix will not be written in the MPEG2 stream.

*MATRIX **MPEGSTD**

8	**16**	**19**	**22**	**26**	**27**	**29**	**34**		**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**
16	**16**	**22**	**24**	**27**	**29**	**34**	**37**		**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**
19	**22**	**26**	**27**	**29**	**34**	**34**	**38**		**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**
22	**22**	**26**	**27**	**29**	**34**	**37**	**40**		**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**
22	**26**	**27**	**29**	**32**	**35**	**40**	**48**		**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**
26	**27**	**29**	**32**	**35**	**40**	**48**	**58**		**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**
26	**27**	**29**	**34**	**38**	**46**	**56**	**69**		**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**
27	**29**	**35**	**38**	**46**	**56**	**69**	**83**		**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**

The next built-in matrices can be used with the *MATRIX command:
(some of these matrices are copyrighted by their respective owners)

*MATRIX **QLB**

8	**16**	**19**	**22**	**26**	**27**	**29**	**34**		**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
16	**16**	**22**	**24**	**27**	**29**	**34**	**37**		**17**	**18**	**19**	**20**	**21**	**22**	**23**	**25**
19	**22**	**26**	**27**	**29**	**34**	**37**	**39**		**18**	**19**	**20**	**21**	**22**	**23**	**24**	**26**
22	**22**	**26**	**27**	**29**	**34**	**38**	**42**		**19**	**20**	**21**	**22**	**23**	**24**	**26**	**28**
22	**26**	**27**	**29**	**32**	**36**	**40**	**50**		**20**	**21**	**22**	**23**	**25**	**26**	**28**	**29**
26	**27**	**29**	**32**	**36**	**40**	**50**	**61**		**21**	**22**	**23**	**24**	**26**	**28**	**29**	**31**
26	**27**	**29**	**35**	**40**	**50**	**59**	**75**		**22**	**23**	**24**	**26**	**28**	**29**	**31**	**34**
27	**29**	**35**	**40**	**50**	**59**	**75**	**89**		**23**	**24**	**25**	**28**	**29**	**31**	**34**	**38**

*MATRIX **NOTCH**

8	**9**	**12**	**22**	**26**	**27**	**29**	**34**		**16**	**18**	**20**	**22**	**24**	**26**	**28**	**30**
9	**10**	**14**	**26**	**27**	**29**	**34**	**37**		**18**	**20**	**22**	**24**	**26**	**28**	**30**	**32**
12	**14**	**18**	**27**	**29**	**34**	**37**	**38**		**20**	**22**	**24**	**26**	**28**	**30**	**32**	**34**
22	**26**	**27**	**31**	**36**	**37**	**38**	**40**		**22**	**24**	**26**	**30**	**32**	**32**	**34**	**36**
26	**27**	**29**	**36**	**39**	**38**	**40**	**48**		**24**	**26**	**28**	**32**	**34**	**34**	**36**	**38**
27	**29**	**34**	**37**	**38**	**40**	**48**	**58**		**26**	**28**	**30**	**32**	**34**	**36**	**38**	**40**
29	**34**	**37**	**38**	**40**	**48**	**58**	**69**		**28**	**30**	**32**	**34**	**36**	**38**	**42**	**42**
34	**37**	**38**	**40**	**48**	**58**	**69**	**79**		**30**	**32**	**34**	**36**	**38**	**40**	**42**	**44**

*MATRIX **BACH1**

8	**16**	**19**	**22**	**26**	**27**	**29**	**34**		**16**	**18**	**20**	**22**	**24**	**26**	**28**	**30**
16	**16**	**22**	**24**	**27**	**29**	**34**	**37**		**18**	**20**	**22**	**24**	**26**	**28**	**30**	**32**
19	**22**	**26**	**27**	**29**	**34**	**34**	**38**		**20**	**22**	**24**	**26**	**28**	**30**	**32**	**34**
22	**22**	**26**	**27**	**29**	**34**	**37**	**40**		**22**	**24**	**26**	**30**	**32**	**32**	**34**	**36**
22	**26**	**27**	**29**	**32**	**35**	**40**	**48**		**24**	**26**	**28**	**32**	**34**	**34**	**36**	**38**
26	**27**	**29**	**32**	**35**	**40**	**48**	**58**		**26**	**28**	**30**	**32**	**34**	**36**	**38**	**40**
26	**27**	**29**	**34**	**38**	**46**	**56**	**69**		**28**	**30**	**32**	**34**	**36**	**38**	**42**	**42**
27	**29**	**35**	**38**	**46**	**56**	**69**	**83**		**30**	**32**	**34**	**36**	**38**	**40**	**42**	**44**

*MATRIX **HC**

8	9	13	20	23	27	29	34
9	11	16	23	26	29	34	39
12	16	21	25	28	33	39	45
15	20	25	28	33	38	44	52
19	24	28	33	38	43	51	60
23	27	32	38	42	49	58	68
27	31	37	42	48	57	67	77
30	36	41	47	55	65	76	87

16	16	18	20	22	24	27	30
16	17	19	22	24	27	30	34
18	19	22	24	27	30	34	39
20	22	24	27	30	34	39	45
22	24	27	30	34	39	45	52
24	27	30	34	39	45	52	60
27	30	34	39	45	52	60	69
30	34	39	45	52	60	69	79

*MATRIX **HCLOW**

8	16	17	18	20	22	26	32
16	16	17	20	22	26	30	36
17	17	18	22	26	30	36	40
18	20	22	26	30	36	40	48
20	22	26	30	36	40	48	56
22	26	30	36	40	48	56	72
26	30	36	40	48	56	72	96
32	36	40	48	56	72	96	108

16	16	17	18	19	20	22	24
16	16	17	19	20	22	24	26
17	17	17	20	22	24	26	30
18	19	20	22	24	26	30	36
19	20	22	24	26	30	36	40
20	22	24	26	30	36	40	48
22	24	26	30	36	40	48	56
24	26	30	36	40	48	56	64

*MATRIX **JAWOR1CD**

8	16	20	23	27	30	32	34
16	16	23	24	29	31	34	38
20	23	27	28	30	35	38	40
23	24	28	29	35	39	40	44
27	29	30	35	39	42	45	50
30	31	35	39	42	46	54	59
32	34	38	40	45	54	62	72
34	38	40	44	50	59	72	84

17	19	21	23	25	27	29	31
19	21	23	25	27	28	29	33
21	23	25	27	29	30	32	37
23	25	27	30	31	34	40	45
25	27	29	31	38	46	54	60
27	28	30	34	46	58	72	74
29	29	32	40	54	72	90	100
31	33	37	45	60	74	100	124

*MATRIX **HVSGOOD**

8	16	16	16	17	18	21	24
16	16	16	16	17	19	22	25
16	16	17	18	20	22	25	29
16	16	18	21	24	27	31	36
17	17	20	24	30	35	41	47
18	19	22	27	35	44	54	65
21	22	25	31	41	54	70	88
24	25	29	26	47	65	88	115

20	20	20	20	21	23	26	30
20	20	20	20	22	24	27	32
20	20	21	22	24	27	31	36
20	20	22	26	30	34	38	44
21	22	24	30	37	44	51	59
23	24	27	34	44	56	68	81
26	27	31	38	51	68	88	109
30	32	36	44	59	81	109	144

*MATRIX **HVSBETTER**

8	16	16	16	17	18	21	24
16	16	16	16	17	19	22	25
16	16	17	18	20	22	25	29
16	16	18	21	24	27	31	36
17	17	20	24	30	35	41	47
18	19	22	27	35	44	54	65
21	22	25	31	41	54	70	88
24	25	29	36	47	65	88	115

19	19	19	19	20	22	25	29
19	19	19	19	20	23	26	30
19	19	20	21	23	26	29	34
19	19	21	25	28	32	37	42
20	20	23	28	35	42	48	56
22	23	26	32	42	53	64	77
25	25	29	37	48	64	83	104
29	30	34	42	56	77	104	137

*MATRIX **HVSBEST**

8	16	16	16	17	18	21	24
16	16	16	16	17	19	22	25
16	16	17	18	20	22	25	29
16	16	18	21	24	27	31	36
17	17	20	24	30	35	41	47
18	19	22	27	35	44	54	65
21	22	25	31	41	54	70	88
24	25	29	36	47	65	88	115

18	18	18	18	19	21	23	27
18	18	18	18	19	21	24	29
18	18	19	20	22	24	28	32
18	18	20	24	27	30	35	40
19	19	22	27	33	39	46	53
21	21	24	30	39	50	61	73
23	24	28	35	46	61	79	98
27	29	32	40	53	73	98	129

*MATRIX **AVAMAT6**

8	16	19	22	26	27	29	34
16	16	22	24	27	29	35	35
19	22	26	27	29	34	35	38
22	22	26	27	29	34	35	40
22	26	27	29	32	35	40	48
26	27	29	32	35	40	48	50
26	27	29	35	40	48	50	60
27	29	35	40	48	50	60	62

16	20	24	28	32	36	40	44
20	24	28	32	36	40	44	48
24	28	32	36	40	44	48	52
28	32	36	40	44	48	52	56
32	36	40	44	48	52	56	58
36	40	44	48	52	56	58	60
40	44	48	52	56	58	60	62
44	48	52	56	58	60	62	62

*MATRIX **AVAMAT7**

8	16	19	22	26	28	32	38
16	16	22	24	28	32	38	44
19	22	26	28	32	38	44	48
22	22	26	32	38	44	48	54
22	26	32	38	44	48	54	64
26	32	38	44	48	54	64	74
32	38	44	48	54	64	74	84
38	44	48	54	64	74	84	94

16	20	24	28	36	42	46	52
20	24	28	36	42	46	52	58
24	28	36	42	46	52	58	62
28	36	42	46	52	58	62	68
36	42	46	52	58	62	68	78
42	46	52	58	62	68	78	88
46	52	58	62	68	78	88	99
52	58	62	68	78	88	99	99

*MATRIX **FOX1**

8	8	9	11	13	13	14	17
8	8	11	12	13	14	17	18
9	11	13	13	14	17	17	19
11	11	13	13	13	17	18	20
11	13	13	13	16	17	20	24
13	13	13	16	17	20	24	29
13	12	13	17	19	23	28	34
12	13	17	19	23	28	34	41

8	8	8	9	9	9	9	10
8	8	9	9	9	9	10	10
8	9	9	9	9	10	10	10
9	9	9	9	10	10	10	10
9	9	9	10	10	10	10	11
9	9	10	10	10	10	11	11
9	10	10	10	10	11	11	11
10	10	10	10	11	11	11	11

* MATRIX **FOX2**

8	8	9	11	13	13	14	17
8	8	11	12	13	14	17	18
9	11	13	13	14	17	17	16
11	11	13	13	13	17	18	20
11	13	13	13	16	17	20	24
13	13	13	16	17	20	24	29
13	12	13	17	19	23	28	34
12	13	17	19	23	28	34	41

8	8	9	10	11	12	12	12
8	9	10	11	12	12	12	13
9	10	11	12	12	12	13	14
10	11	12	12	12	13	14	15
11	12	12	12	13	14	15	16
12	12	12	13	14	15	16	16
12	12	13	14	15	16	16	16
12	13	14	15	16	16	16	16

* MATRIX **FOX3**

8	8	9	11	13	13	14	17
8	8	11	12	13	14	17	18
9	11	13	13	14	17	17	16
11	11	13	13	13	17	18	20
11	13	13	13	16	17	20	24
13	13	13	16	17	20	24	29
13	12	13	17	19	23	28	34
12	13	17	19	23	28	34	41

16	16	16	16	16	16	16	16
16	16	16	16	16	16	16	16
16	16	16	16	16	16	16	16
16	16	16	16	16	16	16	16
16	16	16	16	16	16	16	16
16	16	16	16	16	16	16	16
16	16	16	16	16	16	16	16
16	16	16	16	16	16	16	16

* MATRIX **MANONO1**

8	8	8	9	11	13	14	17
8	8	9	11	13	13	14	17
8	8	11	12	13	14	17	94
9	11	13	13	14	17	17	94
11	11	13	13	14	17	94	94
13	13	14	16	17	20	94	94
13	13	14	17	94	94	94	94
13	14	17	94	94	94	94	94

12	12	13	14	15	16	22	26
12	13	14	15	16	22	26	32
13	14	15	16	22	26	32	41
14	15	16	22	26	32	41	53
15	16	22	26	32	41	53	94
16	22	26	32	41	53	70	94
22	26	32	41	53	70	94	94
26	32	41	53	94	94	94	94

* MATRIX **MANONO2**

8	**12**	**13**	**14**	**15**	**16**	**19**	**22**
12	**13**	**14**	**15**	**16**	**19**	**22**	**26**
13	**14**	**15**	**16**	**19**	**22**	**26**	**32**
14	**15**	**16**	**19**	**22**	**26**	**32**	**41**
15	**16**	**19**	**22**	**26**	**32**	**41**	**53**
16	**19**	**22**	**26**	**32**	**41**	**53**	**70**
19	**22**	**26**	**32**	**41**	**53**	**70**	**94**
22	**26**	**32**	**41**	**53**	**70**	**94**	**127**

12	**12**	**13**	**14**	**15**	**16**	**19**	**22**
12	**13**	**14**	**15**	**16**	**19**	**22**	**26**
13	**14**	**15**	**16**	**19**	**22**	**26**	**32**
14	**15**	**16**	**19**	**22**	**26**	**32**	**41**
15	**16**	**19**	**22**	**26**	**32**	**41**	**53**
16	**19**	**22**	**26**	**32**	**41**	**53**	**70**
19	**22**	**26**	**32**	**41**	**53**	**70**	**94**
22	**26**	**32**	**41**	**53**	**70**	**94**	**127**

* MATRIX **MANONO3**

8	**10**	**10**	**12**	**13**	**15**	**16**	**20**
10	**10**	**12**	**15**	**17**	**19**	**20**	**20**
10	**12**	**15**	**17**	**19**	**20**	**20**	**23**
12	**15**	**17**	**19**	**20**	**20**	**25**	**25**
13	**17**	**19**	**20**	**23**	**25**	**25**	**27**
15	**19**	**20**	**23**	**25**	**27**	**27**	**30**
16	**20**	**20**	**25**	**25**	**27**	**30**	**35**
20	**20**	**23**	**25**	**27**	**30**	**35**	**45**

12	**14**	**17**	**18**	**19**	**20**	**24**	**28**
14	**16**	**17**	**18**	**19**	**23**	**27**	**32**
17	**17**	**18**	**19**	**20**	**27**	**30**	**37**
18	**18**	**19**	**20**	**27**	**30**	**35**	**37**
19	**19**	**20**	**27**	**30**	**35**	**37**	**40**
20	**23**	**27**	**30**	**35**	**37**	**40**	**44**
24	**27**	**30**	**35**	**37**	**40**	**40**	**44**
28	**32**	**37**	**37**	**40**	**44**	**44**	**48**

Adaptive matrices

With HC026 you can change the matrices per GOP.
You have to write your own code to do so and create a DLL which should be named matrix.dll, this DLL should be in the same directory as the HCenc executable.

The next (Fortran 90) example shows how to create the routine and how it should be called.

```
    subroutine EXTMATRIX(motion,luminance,intra,inter)

! input        - motion    integer*4           value 0 - 32 (0=low, 32=high)
! input        - luminance integer*4           averaged GOP luminance per pixel (0 - 255)
! input/output - intra     integer*2 array     intra matrix (64 values, row order)
! input/output - inter     integer*2 array     inter matrix (64 values, row order)

!DEC$ ATTRIBUTES DLLEXPORT:: EXTMATRIX         ! export routine

    integer*4 motion,luminance
    integer*2 intra(64),inter(64)

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!                                                             !
! Example code for adaptive matrix DLL creation.              !
!                                                             !
! DLL: matrix.dll, should be in the same directory            !
! as the HCenc executable.                                    !
!                                                             !
! This Fortran example adapts the intra and inter             !
! matrices dependent of source motion and luminance.          !
! If the *ADAPTIVEMATRIX command is present,                  !
! this routine is called at every GOP during the              !
! first pass so the matrices can change at every GOP.         !
!                                                             !
! Of course you can create any matrix you want, to be         !
! sure matrix values are valid, HCenc will limit all          !
! values between 8 and 255 and set intra(1) to 8,             !
! just like the last 3 lines of code in this example.         !
!                                                             !
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

! motion stuff
    if (motion <= 5) then
      a=1.-(5.-motion)/50.                    ! interpolate factor a to minimum = 0.9 for low motion
    else
      a=1.+(motion-5.)/270.                   ! interpolate factor a to maximum = 1.1 for high motion
    endif

! luminance stuff
    b=1.
    if (luminance < 48) b=0.90                ! lower values for medium dark scenes
    if (luminance < 32) b=0.70                ! lower values for dark scenes

! adapt matrix
    intra=NINT(a*b*intra)                     ! set to nearest integer for whole intra matrix
    inter=NINT(a*b*inter)                     ! set to nearest integer for whole inter matrix

! scale values into "safe values"
    intra=MAX(intra,8); intra=MIN(intra,255)  ! scale intra values, 8 <= intra <= 255
    inter=MAX(inter,8); inter=MIN(inter,255)  ! scale inter values, 8 <= inter <= 255
    intra(1)=8                                ! first intra value should always be 8

    end
```

Note 1: Entering the routine the matrices intra and inter will have the values as given in the inputfile.

Note 2: This example code is just what it says, it's only an example how to create the routine, there's no guarantee this code will improve your encode.

Note 3: Using Fortran it's not necessary to declare local variables, variables are declared implicit: all variables are real*4 except variables which start with i – n, these are integer*4.