

MPEG-2 Encoder Quad Controller

Software

SW-4888

Instruction manual

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1. Introduction

The SW-4888 MPEG2 Encoder Controller software has been designed for setting and controlling the working parameters the MPEG-2 encoder series of CableWorld. The devices of the series are as follows:

- CW-4887 MPEG-2 Encoder Duo, two independent MPEG-2 encoders with ASI outputs
- CW-4888 MPEG-2 Encoder Quad, four independent MPEG-2 encoders with ASI outputs
- CW-4987 MPEG-2 Encoder Duo, two independent MPEG-2 encoders with IP outputs
- CW-4988 MPEG-2 Encoder Quad, four independent MPEG-2 encoders with IP outputs

The devices above comprise the SW-4901 Gigabit Ethernet Controller module of CableWorld. The IP parameters which cannot be varied by the SW-4888 software, can be set by the SW-4901 software. The information for programming the output units of the IP-output versions is available in our publication 'Transport Stream Managing over IP' and can be downloaded from the www.cableworld.eu web site. Configuring the ASI-output versions is much more easier as the ASI module needs no setting. Without correct configuring of the IP receiver no output signal is obtained at the IP-output versions. Before using the CW-4888 software we suggest for new partners studying the descriptions CW-Net.pdf and Using CW-Net.pdf which are available for downloading from our web site. The software can be installed by the exe file downloaded from the software page of the web site. Unless the user specifies otherwise, the installer exe installs the program in the directory

C:\Program Files\CableWorld\SW_4888

After installing the software can be started by clicking the icon appearing on the desktop. The required parameters of the encoder can be set and controlled on one page as shown in Figure 1.1. The independent encoder units can be selected with the tabs at the bottom of the page. (At the duo versions the page for programming can be selected by the first and the second tabs, in the quad versions all the four tabs can be used.) For validating the set operational parameters use the "Load Settings" button. The settings can be modified together or one by one.

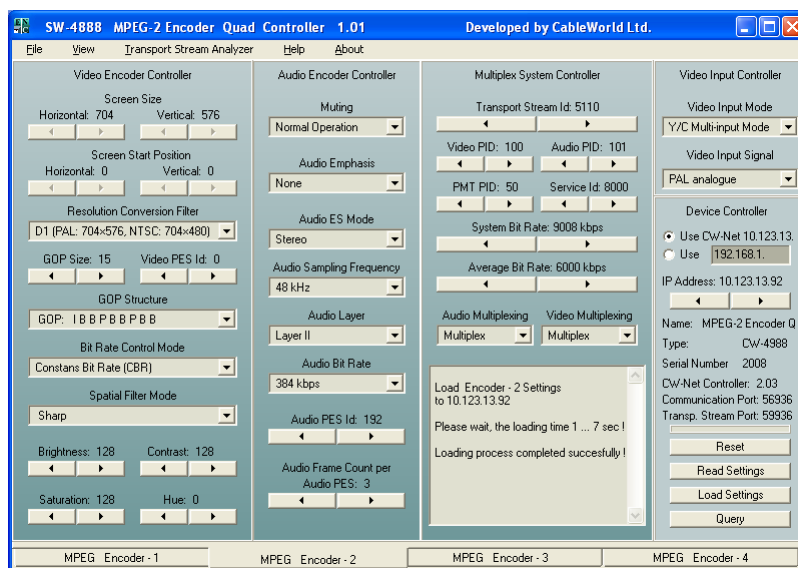


Figure 1.1
GUI of the SW-4888 MPEG-2 Encoder Controller

We appreciate receiving all remarks and comments with our products and software at the cableworld@cableworld.hu e-mail address. Further information on applying the devices can be asked for at the same address.

The SW-4888 software sorts the parameters of the MPEG-2 units to be set according to the main parts of the encoder as follows:

- Video Input Controller
- Audio Encoder Controller
- Video Encoder Controller
- Multiplex System Controller

2. Video Input Controller

The major parameters of the input signal can be set here.

2.1. *Video Input Mode*: It defines the synchronization mode of the input signal. In the Y/C Multi-input Mode the physical synch signals of the input video AD are used for synchronization. In the D1 Input Mode the encoder uses the synchronizing data encoded in the data stream of the digital video signal.

Supplementary information

At devices without analogue (CVBS) input only the latter can be used. (In case of analogue input any of them can be selected but the Y/C Multi-input Mode is recommended.)

2.2. *Video Input Signal*: Here the user must select the kind of the input signal to be encoded. At devices with analogue (CVBS) input, select PAL or NTSC format. At digital (SDI) input encoder use the 525 digital or 625 digital options according to the line number of the input signal.

3. Audio Encoder Controller

In this parameter group the major parameters of the audio encoding can be set.

3.1. *Muting*: On switching (Mute) the audio information will not get to the encoder input. This time the audio elementary stream (ES) is present in the output transport stream henceforward.

3.2. *Audio Emphasis*: Standardized correction of frequency response, pre-emphasis (50/15 μ s or CCITT J.17) can be done in the audio transmission.

Supplementary information:

When applied, the devices on the reception side should restore the flat frequency response (de-emphasis). In normal applications the use of the emphasis is not required, and can be switched off (None option).

3.3. *Audio ES Mode*: The two channels of the audio encoder can be set to the following modes: stereo, joint stereo, dual channel, single channel. (Depending on the bit rate of the audio stream not all possible modes can be used any time. See the details in Chapter 3.6.)

3.4. *Audio Sampling Frequency:* According to the MPEG-2 standard the device supports the following sampling rates: 48 kHz, 44,1 kHz, 32 kHz.

3.5. *Audio Layer:* Layer I or Layer II can be selected according to ISO/IEC 11172.

3.6. *Audio Bit Rate:* Depending on settings Layer I or Layer II, usually the bit rate of the audio stream can be set in the range 32 to 384 kbit/s, to the values defined in the standard. The software offers these possible values automatically in the pull-down menu.

Supplementary information:

The audio bit rate, the bit rate of the output transport stream, the layer and the audio mode are in close relationship with each other. The manufacturer of the MPEG-2 encoder chip give various recommendations for the joint, correct setting of these parameters. These are summarized in the tables as follows:

Audio Bit Rate	Audio Layer	
	Layer1	Layer 2
32Kbps	A	A
48Kbps	N	A
56Kbps	N	A
64Kbps	A	A
80Kbps	N	A
96Kbps	A	A
112Kbps	N	A
128Kbps	A	A
160Kbps	A	A
192Kbps	A	A
224Kbps	A	A
256Kbps	A	A
288Kbps	A	N
320Kbps	A	A
352Kbps	A	N
384Kbps	A	A
416Kbps	A	N
448Kbps	A	N

Figure 3.6.1

Bit rate and layer combinations
(A: allowed, N: not allowed)

Audio Bit Rate	Audio ES Mode			
	STEREO	JOINT STEREO	DUAL CHANNEL	SINGLE CHANNEL
32Kbps	N	N	N	A
48Kbps	N	N	N	A
56Kbps	N	N	N	A
64Kbps	A	A	A	A
80Kbps	N	N	N	A
96Kbps	A	A	A	A
112Kbps	A	A	A	A
128Kbps	A	A	A	A
160Kbps	A	A	A	A
192Kbps	A	A	A	A
224Kbps	A	A	A	N
256Kbps	A	A	A	N
320Kbps	A	A	A	N
384Kbps	A	A	A	N

Figure 3.6.2.

Bit rate and mode combinations
(A: allowed, N: not allowed)

System bit rate (kbps)		Audio bit rate (kbps)							
		MPEG Layer1			MPEG Layer2				
		32	64	96	32	48	56	64	
CBR	2000	A	A	A	A	A	A	A	
	4000	A	A	A	A	A	A	A	
	8000	N	N	A	N	N	A	A	
VBR	2000[Ave.] 4000[Max]	A	A	A	A	A	A	A	
	4000[Ave.] 6000[Max]	N	A	A	A	A	A	A	
	6000[Ave.] 8000[Max]	N	A	A	N	A	A	A	
	9000[Ave.] 14992[Max]	N	N	A	N	N	N	A	

Figure 3.6.3

The combinations of the audio ES bit rate and the layers for a few recommended output transport stream bit rate, in CBR and VBR mode
(A: allowed, N: not allowed)

The SW-4888 software automatically excludes the main part of the settings not supported. If the user wants to use a wrong setting, the front panel (red) ERROR LED flashes for a few seconds and the software automatically restores the former operable setting.

3.7. *Audio PES Id*: According to the ISO/IEC 13818-1 standard, the identifier byte of the packeted audio elementary stream (PES) can be set to optional values, except the three upper bits (b110xxxxx). (The software permits the valid settings only.)

3.8. *Audio Frame Count per Audio PES*: The user can set the number of audio frames in the audio packets. The suggested value is 3 to 6.

4. Video Encoder Controller

This parameter block comprises the main parameters of the MPEG-2 video encoding to be set.

4.1. *Resolution Conversion Filter*: The resolution of the encoded video signal (number of pixels by line multiplied by the number of lines) can be set in this menu point with the conversion filter. The following values are possible:

	PAL	NTSC
D1 :	704 x 576	704 x 480
3/4 D1	528 x 576	528 x 480
2/3 D1	480 x 576	480 x 480
1/2 D1	352 x 576	352 x 480
SIF	352 x 288	352 x 240
QSIF	176 x 144	176 x 112
Slice Screen	See item 4.2.	

4.2. *Screen Size and Screen Start Position*: If the 'Slice Screen' is selected in the Resolution Conversion Filter, an optional part of the picture can be cut out and enlarged to the full screen size. The zero points of the cutting are defined by the values of the Horizontal Start Position and the Vertical Start Position. The size of the cut-out part is defined by the Horizontal Screen Size and the Vertical Screen Size respectively.

Supplementary information:

Important limitation: the sum of the Horizontal Start Position and the horizontal size must not be greater than 720. Similarly the sum of the Vertical start position and size must not exceed the 576 (PAL) and the 480 (NTSC) values, respectively. The values given for the position and size must be divisible by 32, which is automatically covered by the software.

4.3. *GOP Size*: In this menu item the size of the GOP (Group of Pictures defined in the ISO/IEC 13818-2 Video standard) can be set between 1 and 255. (For correct setting see item 4.4!)

4.4. *GOP Structure*: The following GOP structures can be selected: a) IIIIII, b) IPPPPPP, c) IBPBPBPBP, d) IBBPBBPBB. (I: intra encoded picture, without prediction. P: predicted picture, at encoding. B: bi-directionally predicted picture.)

Supplementary information:

The GOP Size (see at 4.3) adjusted, must be divisible by two at the c) version and by three at the d) version. Otherwise an error signal appears and the previous valid setting will be restored automatically.

At the a) version, at resolutions 2/3 D1, 3/4 D1, or D1, the output bit rate must be set to lower than 4 Mbit/s.

At the b) version, at resolution D1, the output bit rate must be higher than 3,5 Mbit/s.

- 4.5. *Video PES Id:* According to the ISO/IEC 13818-1 standard, the identifier byte of the packetized video elementary stream (PES) can be set to optional values, except the four upper bits (b1110xxxx). In this menu item only the four lower bits should be set, so the range is 0 to 15.
- 4.6. *Bit Rate Control Mode:* The MPEG-2 encoder is able for encoding of constant bit rate (CBR) and variable bit rate (VBR). The required mode can be set here. (See details in chapter 5.)
- 4.7. *Spatial Filter Mode:* The Spatial Filter can be used for setting sharp or soft picture. The possible settings are: Soft, Standard, Sharp.
- 4.8. *Brightness:* The brightness of the encoded picture can be set from 0 to 255. (Suggested setting: 128.)
- 4.9. *Contrast:* The contrast can be set from 0 to 255. (Suggested setting: 128.)
- 4.10. *Saturation:* The saturation of the colours of the encoded picture can be set from 0 to 255. (Suggested setting: 128.)
- 4.11. *Hue:* The hue of the encoded picture (the angle of the axes of the colour difference signals) can be set in the range 0 ... 255, (+ 180° = dec127, - 180° = dec128, 0° = 0).
Supplementary information:
Be careful with this parameter, as a few degrees of alteration causes heavy alteration of hue, whereas the human eyes are very sensitive to the colours of the body! **The use of the 0 value is strongly recommended (i.e. 0°)!**

5. Multiplex System Controller

These are the main parameters of the output transport stream.

- 5.1. *Transport Stream Id:* The output transport stream identifier can be set here. It will be placed in the PAT table (Program Association Table) generated by the encoder according to the standard. Range: 1 ... 65535.
- 5.2. *Video PID:* The video packet identifier can be set here. It must not be equal to another PID! Range: 33 ... 8190.
- 5.3. *Audio PID:* The audio packet identifier can be set here. It must not be equal to another PID! Range: 33 ... 8190.
- 5.4. *PMT PID:* The identifiers of the packets carrying the data of the Program Map Table (PMT) can be set here. The PMT is generated by the encoder according to the standard. It must not be equal to another PID! Range: 16 ... 8190.
- 5.5. *Service Id:* The service identifier (program number) situated in the PMT table can be set here. Range: 1 ... 65535.

5.6. *System Bit Rate*: The bit rate of the output transport stream can be set between 992 kbit/s and 20000 kbit/s. When necessary, the encoder inserts the proper quantity of null packets in the stream for achieving the required bit rate. In case of variable bit rate (VBR) encoding, the value here is the maximal bit rate.

The value set here must be divisible by 16. It is provided by the software.

5.7. *Average Bit Rate*: This parameter is used in VBR mode. Its value must be less than the system bit rate set in previous point. The suggested ratio under 6 Mbit/s system bit rate is at least 1:2, above this bit rate is 1,5:2.

Supplementary information:

The selected bit rates (beyond other parameters) essentially affect the quality of the picture. So the optimal setting of them (considering the available bandwidth) is of primary importance.

5.8. *Audio Multiplexing, Video Multiplexing*: The audio or the video elementary stream (or both of them) can be removed from the output transport stream when necessary. Here select the Do not Multiplex setting.

6. Monitoring the operating parameters and other characteristics

6.1. *The content of the information box*: By the help of "Read Settings" a number of useful information can be obtained about the operation of the encoders. On clicking this button the PC queries the current settings of the selected encoder and writes them in the boxes of the appropriate parameter. So the current parameter list and e.g. the execution of the modification sent out last.

At the same time in the box at the lower part of the System Controller block more information appears, as follows:

- *Encoder Status* : (Active/Not Active) If the examined encoder is active, it means that the loading of the firmware has been finished and the internal controller has started the encoder.
- *Video Input Standard*: (PAL, NTSC, etc.) In case of analogue (CVBS) input encoder the colour standard of the analogue input signal is detected by the video AD converter.
- *Peak White*: (Detected/Not Detected) Whether higher than the standard peak white level (overdrive) has been detected at the input of the video AD.
- *Line Alternating*: (Yes/No) Whether the line structure of the input analogue (CVBS) signal is alternating or progressive.
- *Field Rate*: Input signal field rate.
- *Colour Subcarrier*: (Locked/Not Locked)
- *Vertical Sync*: (Locked/Not Locked)
- *Horizontal Sync*: (Locked/Not Locked) Whether the video AD is locked to the colour subcarrier and the field and line synch signals.
- *Encoder Firmware*: The version number of the encoder firmware.
- *Controller Firmware*: The version number of the controller firmware supervising the encoder.

Supplementary information:

As could be seen in the previous chapters, the valid values of some parameters depend on a number of other parameter settings. In case of wrong command combination or range the encoder sends an error message. On clicking the "Read Settings", in the box mentioned above the name of the command guessed wrong appears, and the microcontroller restores the previous correct setting simultaneously.

6.2. *The front panel LEDs:*

On the front pane of the device 4×3 (Quad version) or 2×3 (Duo version) LEDs are located, respectively

The yellow LED indicates the active status of the given encoder. It means that the firmware has been loaded, the encoder has been configured and started with the valid parameters. But it means no a perfect transport stream at the output automatically. When it is not lighting during operation; it indicates malfunction!

The green LED lights in two cases:

- 1) The firmware loading is under way. After switching on or reset, the internal microcontroller starts loading the firmware in the given encoder. **Because of the great number of data it takes about 45 seconds!** Then the encoder will be configured and started.
- 2) On starting the encoder no signal is detected by the video AD at the CVBS input.

The red LED indicates the erroneous operation of the encoder or the reception of a wrong command. In the latter case the LED goes out after 4...5 seconds and the encoder goes on working with the previous valid settings.

7. **Saving the encoder settings**

The settings will be saved in five files as follows:

Directory\File	Content
source directory\SW4888.ini	– IP settings, type numbers
settings\Encoder1.ini	– Encoder-1 settings
settings\Encoder2.ini	– Encoder-2 settings
settings\Encoder3.ini	– Encoder-3 settings
settings\Encoder4.ini	– Encoder-4 settings

On closing the program with saving, these five files will be created or rewritten.

On starting the program, also these five files will be loaded in, with the settings to start.

In the File menu also these files can be saved or loaded in with the "Save/Load settings" commands.

With the help of the "Save Encoder settings as" and the "Load Encoder settings from" the settings of one encoder can be saved or loaded at a time. So on saving a given setting it can be called in to any encoders.

Supplementary information:

For getting over the difficulties of the initial settings, two factory settings are located in the settings directory as follows:

The Default_CBR.ini is for general use, with constant bit rate. The Default_VBR.ini is a setting with variable bit rate. After calling in these settings (if the encoder operates correctly), these can be cut to the individual demands.

For controlling the output transport stream the analyser program (installed previously) can be used. It can be selected in the "Transport Stream Analyzer" menu item.