

# **MPEG-4 (H.264) Encoder Duo Controller**

**Software**

**SW-4412**

**Instruction manual**

## Contents

1. Introduction.....	3
2. Input source selector.....	4
3. High Definition (HD) video format selector.....	5
4. Standard definition (SD) video format selector.....	5
5. Converted video format selector.....	6
6. Setting the video bitrate.....	6
7. Setting the audio parameters.....	6
8. Setting the output transport stream parameters.....	7
9. Controlling the operating parameters and other features.....	8
10. Saving the encoder settings.....	9

## 1. Introduction

The SW-4412 MPEG-4 Encoder Controller software has been designed for setting and controlling the working parameters the H.264 encoder series of CableWorld. The devices of the series are as follows:

- CW-4411 MPEG-4 Encoder, H.264 encoder with ASI and IP outputs
- CW-4412 MPEG-4 Encoder Duo, two independent H.264 encoders with ASI and IP outputs
- CW-4511 MPEG-4 Encoder, H.264 encoder with IP output
- CW-4512 MPEG-4 Encoder Duo, two independent H.264 encoders with IP outputs

These devices consist of two main parts, the MPEG-4 encoding unit and the CW-4901 Gigabit Ethernet Controller module, which continuously communicates with the programming computer and produces the output IP data stream according to the settings. For programming of these two units the SW-4901 and SW-4412 programs should be downloaded from the [www.cableworld.eu](http://www.cableworld.eu) web site and installed on the user's computer. 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 same 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-outputs.

Before using the CW-4412 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\_4412**

After installing the software can be started by clicking the icon appearing on the desktop. With Windows 7 or Vista operating system, the Program Files directory is highly protected. Only the system administrator can log on for change. In such a case, install your own software in an arbitrary directory.

The software products of CableWorld always include detailed help that is available in pdf format on our web site, too.

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 both tabs must be used.) For validating the set operational parameters use the "Load Settings" button. In this case the settings are saved automatically. After switching off or reset the device starts with these settings. The settings can be modified together or one by one.

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

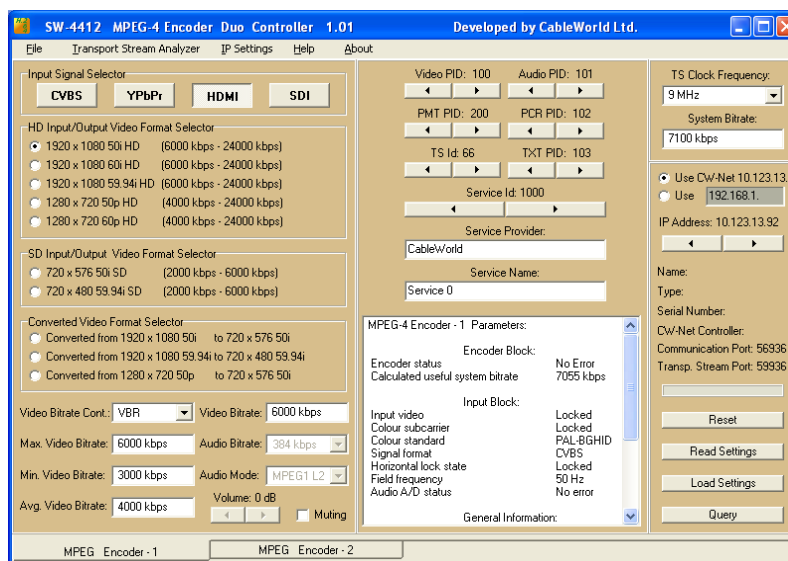


Figure 1.1.  
GUI of the SW-4412 MPEG-4 Encoder Duo Controller

The parameters of the MPEG-4 encoder units to be set are described in the following grouping:

- Input source selector
- High Definition (HD) video format selector
- Standard Definition (SD) video format selector
- Converted video format selector
- Setting video bitrate
- Setting audio parameters
- Setting output transport stream parameters

## 2. Input source selector

The encoder can receive data to be compressed from two different analog and also two digital sources.

2.1. *CVBS*: Composite video (PAL, SECAM, NTSC). The BNC connector on the back of the device serves as the input of the analog composite video signal. In this mode, the encoder processes the analog stereo sound led to the RCA connectors (L: white, R: red).

Supplementary information:

The teletext lines inserted into the vertical blanking interval of the composite video signal are processed in a separate unit and added to the output compressed video and audio stream as a user (user private) elementary stream.

2.2. *YPbPr*: Component (brightness, and color difference) signal input. The connection must be carried out as follows:

Blue colored RCA connector: Pb (blue color difference signal)

Red colored RCA connector: Pr (red color difference signal)

Green colored RCA connector: Y (luminance)

Supplementary information:

This input can be connected to standard or high definition video signals. The audio input signal can be connected to the analog (L, R) inputs as discussed in the preceding paragraph.

2.3. *HDMI (High Definition Multimedia Interface)*: This input can be connected to any signal source with HDMI interface via special HDMI type A connector of the back-panel. Since the HDMI transmission comprises the sound too, then the audio and video data are transmitted in one cable. The encoder automatically detects and processes the incoming video and audio signals.

2.4. *SDI (Serial Digital Interface)*: Formerly the SDI interface was used only for linking professional video equipment within the studio at the transmission of uncompressed digital video signals. Today, the SDI interface can be found at the inputs and outputs of more and more equipments of cable television and other fields. Its great advantage is that one single coaxial cable can be used for transmitting the picture and sound.

The standard BNC connector on the back panel of the MPEG-4 encoder is used for connecting the SDI signal. Over time the SDI transmission developed to a fairly wide range of standard family. The encoder supports the following formats: SD-SDI (SMPTE 259M, 270 Mbit / s), HD-SDI (SMPTE 292M, 1.485 Gbit / s). The transmission of sound (embedded audio) is provided in the form of additional data, according to SMPTE 272M (SD-SDI) and SMPTE 299M (HD-SDI).

Additional information:

Due to the high bitrate use high-quality, double shielded coaxial cable, and try to minimize the length of the cable, although originally the standard guarantees hundreds of meters of transmission quality.

### **3. High Definition (HD) video format selector**

For the correct operation of the MPEG-4 encoder the format of the incoming video signal should be selected exactly. In this block the right one can be selected from the HD format input signals. Be careful to choose the correct number of pixels, the number of lines and the frame rate as well.

Additional information:

E.g. 1920x1080 50i means: 1920 pixels per line horizontally and 1080 lines per frame and 50 interlaced fields per second, where the lines are interlaced between the fields. Behind each of the formats, in brackets the minimum and maximum video bitrates are shown. This should then configure the bitrates. (See below)

### **4. Standard definition (SD) video format selector**

Here are two standard-definition video formats to select. Such input signals can arrive from the CVBS input, HDMI and SDI input. The 720x576 50i is the digital equivalent of the most common PAL and SECAM versions, while the digitization of NTSC provides the 720x480 59.95i resolution.

## 5. Converted video format selector

The MPEG-4 encoder can convert certain formats to other formats. The main rule is that you can convert only to a lower-resolution format and not to 'up'. The conversion of the frame rate is not possible. Accordingly, in this block from the most common HD formats, 720x576 or 720x480 resolution video signal can be produced.

Additional information:

Progressive structure of images (e.g. 1280x720 50p) can be converted to interlaced format, but not vice versa.

## 6. Setting the video bitrate

6.1. *Video Bitrate Control:* The MPEG-4 encoder can encode video with constant (CBR) and variable (VBR) bitrate.

6.2. *Video Bitrate:* In CBR mode, you have to give the desired constant bitrate of video coding. If the chosen bitrate is too low it degrades the image quality, but pay attention that the adjusted value is between the borders of bitrates of the pre-selected format!

Additional information

In such windows always some type of figures should be entered. After the first character is entered, the window background color changes to yellow, which reminds of the characters that have not yet been processed. This can only be done after you press ENTER. In this case, the background color changes back to white and the entered value becomes valid. If the erroneous input (e.g. the letter characters have been entered into), the program automatically takes into account the minimum value of the given parameter.

6.3. *Maximal Video Bitrate, Minimal Video Bitrate, Average Video Bitrate:* If the variable bitrate (VBR) encoding mode is selected, the coder calculates the actual video bitrate by taking into account the set maximum, minimum and average bitrates in accordance with the algorithm of the internal control program. When setting these parameters, the following mathematical relationships are to be considered:

$$\begin{aligned} \text{Video Bitrate} &\geq \text{Maximal Video Bitrate}, \\ (1,5 \times \text{Average Video Bitrate}) &\leq \text{Maximal Video Bitrate} \leq (2 \times \text{Average Video Bitrate}), \\ 0 &\leq \text{Minimal Video Bitrate} \leq (0,75 \times \text{Average Video Bitrate}) \end{aligned}$$

Additional information:

The SW-4412 software controls the above context. If any of them is not satisfied, it sends an error message in the report box and the reprogramming fails.

## 7. Setting the audio parameters

7.1 *Audio Mode:* Here you can set the audio encoding process. Normally, the MPEG1 Layer 2 selection is recommended. If the external source can provide a compressed AC3 sound according to SPDIF protocol, then selecting the *SPDIF AC3* option the coder is capable of multiplexing this data stream with the compressed video, without compression. This box is not active in case of HDMI and SDI input format, then the mode is selected automatically.

Additional information:

On request the MPEG-4 encoder can be made suitable for AC3 or AAC audio encoding of the two-channel audio input.

Such request must be discussed with CableWorld Ltd in advance.

**7.2 Audio Bitrate:** This box is used for setting the bitrate of the compressed audio stream. It is active only with analog (CVBS or YPbPr) input sources, otherwise the bitrate cannot be changed because of the built in sound.

**7.3 Volume:** When using an analog audio input (CVBS or YpbPr), the volume can be controlled. The  $\pm 12$  dB control range is possible.

**7.4 Muting:** In each input mode (CVBS, YPbPr, HDMI, SDI), the sound can be muted by activating the checkbox if necessary.

## **8. Setting the output transport stream parameters**

**8.1 Video PID:** Setting the PID of the video packets. Other PID not be the same! Range: 33 to 8190.

**8.2 Audio PID:** Setting the PID of the audio packets. Other PID not be the same! Range: 33 to 8190.

**8.3 PMT PID:** Setting the PID of the packets carrying the data of the PMT (Program Map Table), generated by the encoder according to the standard. Other PID not be the same! Range: 16 to 8190.

**8.4 PCR PID:** Setting the PID of the PCR (Program Clock Reference); carrying the timing information. Other PID not be the same! (Not even the video PID!) Range: 16 to 8190

**8.5 TXT PID:** If the input comprises teletext lines, the encoder will insert them in packets according to the standard, the PID of these packets can be set here. Range: 33 to 8190. These packets constitute a private elementary stream, which is multiplexed to the output transport stream by the encoder.

Additional information:

There are other restrictions on setting the PIDs. For more information see the ISO / IEC 13818-1 standard.

**8.6 TS Id:** The set value is the identifier of the output transport stream. It is placed in the coder-generated PAT (Program Association Table), according to the above-referenced Standard. Value range: 1 to 65535

**8.7 Service Id:** The value of the standard service identifier (program number) of the PMT table can be specified here. Value range: 1 to 65535.

**8.8 Service Name, Service Provider:** The Service Descriptor placed in the SDT (Service Description Table) contains the name of the program and the name of the program provider.

These characteristics must be entered in the appropriate boxes. The service provider name can be up to 20 characters, and the name of the program can be up to 25 characters.

Additional Information:

For more information on the SDT and the descriptors can be found in the ETSI / EN 300 468 standard.

8.9. *TS Clock Frequency*: The output transport stream clock frequency can be selected from the values of the drop-down menu. This value will be a continuous transport stream clock inside the device. In general use 9 MHz is recommended

8.10. *System Bitrate*: The resulting bitrate of the transport stream obtained by encoding. For the safe operation it must be a few percent more than the sum of the components' bitrates in the TS. In this case the encoder adjusts the value we provide by the insertion of null packets.

## 9. Controlling the operating parameters and other features

9.1. *The content of the information box*: Using the "Read Settings" a variety of useful information can be obtained about the operation of the encoder units. After clicking the button the computer retrieves the current settings of the selected encoder and enter them in the appropriate parameter boxes. This will verify the actual parameter list, as well as the implementation of the last changes.

On clicking the "Read Settings", in the box under the Service Name, more data appear in groups about the encoder operation. The volume and content of these depends on the type of input signal chosen in point 2.

The data sets available here are as follows:

- ◆ *Encoder Block*: Here you can check the possible error message of the encoder chip. In addition, information is obtained about the resulting TS bitrate calculated from the set bitrates. In general case, this value is recommended to set for safe operation. (Compared to the theoretical value of approx. 5% reserves included.)
- ◆ *Input Block*: It contains a number of parameters about the input video and audio signal (number of pixels, different PLL states, audio parameters, etc.). Of course, the parameters appear always to match the active input signal.
- ◆ *General Information*: General information about the encoder and the controller software and a variety of hardware chip versions can be found here.

9.2. *Front panel LEDs*: On the front plate of the device 4 LEDs or 2x4 LEDs (in the Duo version) can be found.

*Input LED*: It lights up when the device detects video signal at the pre-selected input.

*Busy LED*: Longer or shorter flashes indicate, while the firmware is loaded, or processing the parameters is taking place and the MPEG-4 encoding is paused.

*HD LED*: It lights continuously if the MPEG-4 encoded output stream contains HD video information (1920x1080i or 1280x720p resolution).

*Error LED*: In case of coding error (e.g. the device detects something wrong parameter), the LED flashes once or more times. (When the error is detected, the encoder chip is always reset, and tries to start the encoding again and again till the error is resolved.)



## 10. Saving the encoder settings

The settings are saved in three files as follows:

<i>The path and file name</i>	<i>Content of the file</i>
source directory\SW4412a.ini	– IP settings, type numbers
settings\Encoder1.ini	– Encoder-1 settings
settings\Encoder2.ini	– Encoder-2 settings

When the program is closed with saving, these three files will be created or edited. Also at starting the program these three files are loaded and the program will start with their settings.

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

With the "Save encoder settings as" and "Load from Encoder settings" you can only save or load settings for a single encoder. Thus, a saved setting can be recalled for any of the encoders.

### Additional Information:

In order to reduce the initial set-up difficulties two factory default settings can be found in the settings directory: The Default\_CBR.ini is a general-purpose, constant bitrate, and the Default\_VBR.ini is a variable bitrate setting for the HDMI input, in HD-quality encoding. After calling them (if the encoder works flawlessly with these) the settings later can be customized to the individual needs.

For checking the output transport stream the (previously installed) analyzer program can be used, which was selected in the "Transport Stream Analyzer" menu item.