



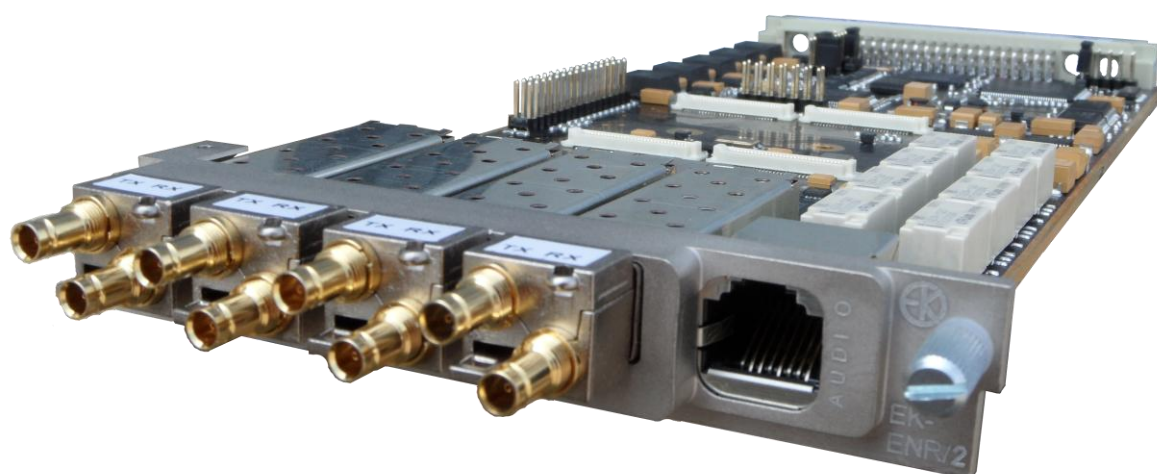
# User Manual

Board

Dual Channel Encoder H.264

HD/SD SDI/PAL/NTSC

2 Video + 4 Audio



## EK-ENR/2

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**Warning!**

**The socket utilized for the unit supply must have the appropriate ground conductor.**

**The connection of the unit , to a socket without the ground conductor, will make the whole equipment dangerous for people safety.**

**About the repairing of the units please refer to specialized personnel only .**

**Inside the devices there are voltages which could be dangerous to people.**  
**Before opening the cover switch off the unit, disconnect the connection and the supply cables.**

**In case of electrical shock please follow the instructions of first aid listed on page 4**

**Substitute the fuses interrupted with others of the same type and voltage.**



**The waste disposal of the devices must be executed in the respect of the enforced laws in the country uses.**  
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## First aid: artificial breathing(mouth to mouth)

<p>1</p>	<p>In case of electric shock you have to ensure the first aids to the patient, but to do this you have to consider two very important things:  - <b>interrupt immediately the electric circuit;</b>  - <b>if the circuit has not been interrupted, do not touch the patient with bare hands;</b>  After doing this, without delay contact the nearest mobile unit of first aid and practice to the patient, in case of loss of consciousness, the breathing mouth to mouth as described below.</p>	
<p>2</p>	<p>Put the patient lying on his back with the arms parallel to the body, ensure that he does not have the breathing tracts obstructed (chewing-gum, dental prosthesis, etc.), otherwise set him free from foreign bodies.  Kneel near the patient's head and putting a hand under his neck, incline as possible his/her head backwards.</p>	
<p>3</p>	<p>Going on with keeping the patient's head inclined with one hand, use the other one to occlude the nostrils, if you are going to practise the breathing through the oral cavity, or occlude the mouth if you want to do it through the nasal cavity.  While doing this begin the auto-oxygenation, with deep breathing.  Then practice the artificial breathing blowing in the chosen cavity beginning with ten expirations each minute to go on them with twelve and fifteen.</p>	
<p>4</p>	<p>During the breathing procedure you have to control that the patient's chest dilates, otherwise change cavity where to blow the air because the previous one could be obstructed.</p>	
<p>5</p>	<p>Do not ever stop the artificial breathing until the patient has recovered or the first aid unit has come.</p>	

## Revision History

Manual Revision	Software		Notes
A (05/11/2014)	DSP	10.27	
	FPGA S6	10.8	
	FGPA V6	2.34	
	RamDisk	1.0	
	HW	C.F	
B (05/11/2014)	DSP	10.27	Audio RJ-45 connections modified (chapter 3)
	FPGA S6	10.8	
	FGPA V6	2.34	
	RamDisk	1.0	
	HW	C.F	

<b>1. GENERAL INTRODUCTION .....</b>	<b>8</b>
<b>2. BOARD MENU .....</b>	<b>12</b>
2.1 STATUS MENU .....	14
2.1.1 Status → Card State .....	14
2.1.2 Status → Video 1 State .....	15
2.1.3 Status → Audio1 State .....	15
2.1.4 Status → Video 2 State .....	16
2.1.5 Status → Audio 2 State .....	16
2.1.6 Status → Mux State .....	17
2.1.7 Status → Board Temp .....	17
2.2 SETTINGS MENU .....	18
2.2.1 Settings → Video 1 Encoder → Video 1 .....	18
2.2.2 Settings → Video 1 Encoder → Video 1 In .....	18
2.2.3 Settings → Video 1 Encoder → Video 1 BR .....	19
2.2.4 Settings → Video 1 Encoder → Video 1 Pid .....	19
2.2.5 Settings → Video 1 Encoder → Video 1 Pcr .....	19
2.2.6 Settings → Audio 1 Encoder → Audio 1 .....	20
2.2.7 Settings → Audio 1 Encoder → Audio 1 In .....	20
2.2.8 Settings → Audio 1 Encoder → Audio 1 BR .....	21
2.2.9 Settings → Audio 1 Encoder → Audio 1 Pid .....	21
2.2.10 Settings → Audio 1 Encoder → Audio 1 Grp .....	22
2.2.11 Settings → Audio 1 Encoder → Audio 1 R .....	23
2.2.12 Settings → Audio 1 Encoder → Audio 1 L .....	23
2.2.13 Settings → Video 2 Encoder → Video 2 .....	24
2.2.14 Settings → Video 2 Encoder → Video 2 In .....	24
2.2.15 Settings → Video 2 Encoder → Video 2 BR .....	25
2.2.16 Settings → Video 2 Encoder → Video 2 Pid .....	25
2.2.17 Settings → Video 2 Encoder → Video 2 Pcr .....	25
2.2.18 Settings → Audio 2 Encoder → Audio 2 .....	26
2.2.19 Settings → Audio 2 Encoder → Audio 2 In .....	26
2.2.20 Settings → Audio 2 Encoder → Audio 2 BR .....	27
2.2.21 Settings → Audio 2 Encoder → Audio 2 Pid .....	27
2.2.22 Settings → Audio 2 Encoder → Audio 2 Grp .....	28
2.2.23 Settings → Audio 2 Encoder → Audio 2 R .....	29
2.2.24 Settings → Audio 2 Encoder → Audio 2 L .....	29
2.3 Set output menu .....	30
2.3.1 Set Output → Mux BR .....	30
2.3.2 Set Output → SFP1 .....	34
2.3.3 Set Output → SFP2 .....	36
2.3.4 Set Output → INT Out .....	37
2.4 Revision menu .....	38
2.4.1 Revision → DSP .....	38
2.4.2 Revision → FPGA S6 .....	38
2.4.3 Revision → FPGA V6 .....	38
2.4.4 Revision → RamDisk .....	38
2.4.5 Revision → HW .....	38
<b>3. AUDIO RJ-45 CONNECTIONS .....</b>	<b>39</b>

## Definitions

<b>EK-MFR/x</b>	EK-MFR/1 and EK-MFR/2
<b>NA</b>	Not Available
<b>SFP</b>	Small form-factor pluggable
<b>TS</b>	Transport Stream
<b>SDI</b>	Serial Digital Interface
<b>SD</b>	Standard Definition
<b>HD</b>	High Definition

## 1. GENERAL INTRODUCTION

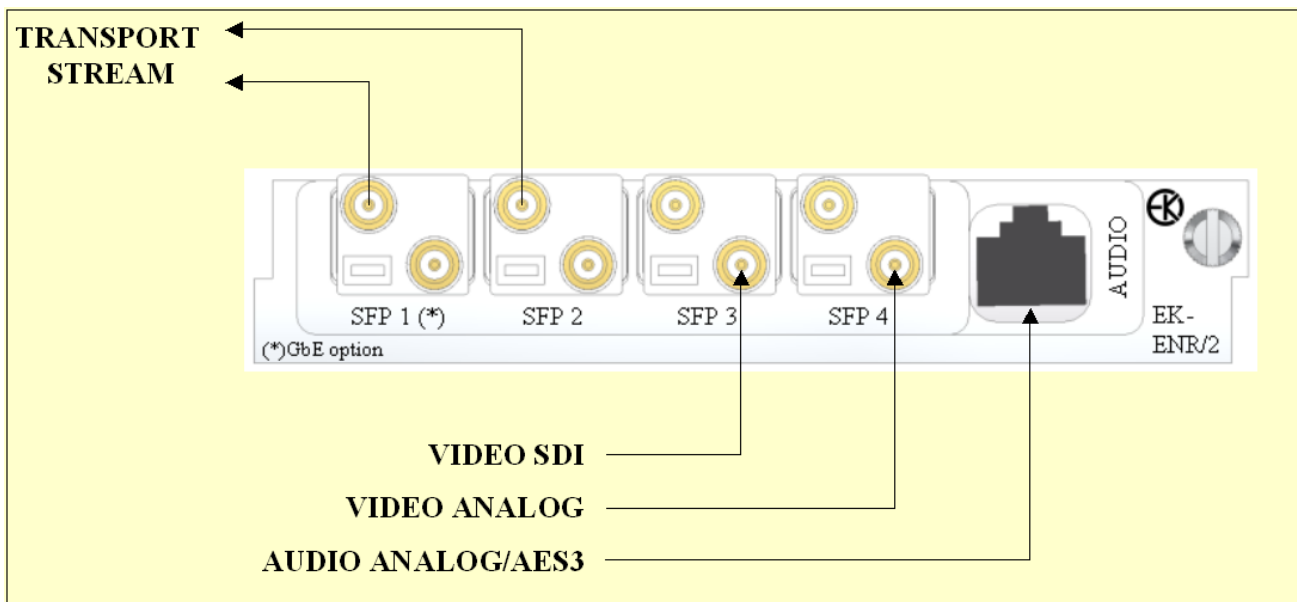
The EK-ENR/2 card is a double audio/video encoder.

It is able to encode up to 2 video and 4 audio in a single output transport stream.

This card must be used in an EK-MFR/x mainframe in order to configure it in the right way.

The input/output connectors (figure 1) are on the back of the board and basically you have:

- 4 SFP connectors with input/output capability used for transport stream (SFP1, SFP2) and SDI or analog video (in default configuration you have SFP3 for SDI video and SFP4 for analog video)
- 1 RJ-45 connector used for analog and AES3 audio



**Figure 1** – EK-ENR/2 Input/Output connectors

The video input can be in SDI or analog format, with SD or HD resolution and it is encoded conforming to ISO/IEC14496-10 (H.264/AVC) standard.

The audio input can be sourced from SDI embedded, analog or AES3 signal and it is encoded conforming to MPEG-1 Layer 2 standard.

The output transport stream is conform to ISO/IEC 13818-1 standard and it is present in ASI standard electrical format on the SFP1 and SFP2 connectors.

The transport stream can also be output through the mainframe's internal matrix in order to feed another card (i.e. the EK-UNM/3 modulator) without using an external cable.

In figure 2 you can see the EK-ENR/2 block scheme.



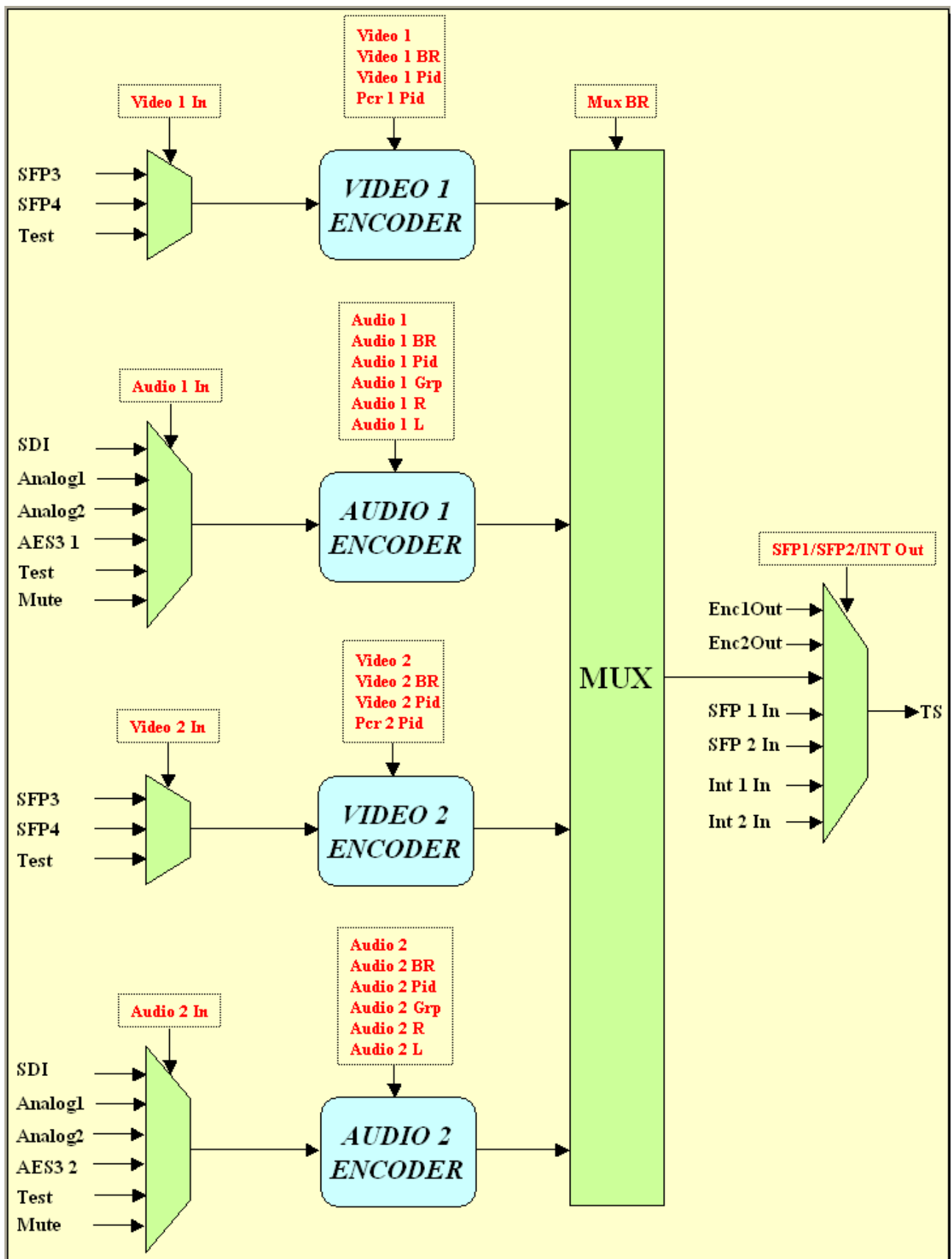


Figure 2 – EK-ENR/2 block scheme

In the EK-ENR/2 block scheme (figure 2) you have in red the card menu voices that you have to use in order to set the card functionality (see chapter 2).

In the figure 2 you can see:

- the video encoder input selector that allows you to feed the video encoder with the signal coming from the SFP3, the SFP4 or with a test signal (see 2.2.2, 2.2.14)
- the audio encoder input selector that allows you to feed the audio encoder with the signal coming from the analog input (on RJ-45), the AES3 input (on RJ-45), the SDI audio embedded, with a test signal or with a “mute” (see 2.2.7, 2.2.19).
- the two H.264 video encoders
- the two MPEG-1 layer 2 audio encoders
- the output mux that allows you to multiplexer the encoders output TS in a single TS (see 2.3.1).
- The output selector that allows you to choose which TS put out (see 2.3.2, 2.3.3, 2.3.4)

The EK-ENR/2 is a flexible and highly configurable system.

You can work with both SDI or analog video signal and SDI embedded, analog or AES3 audio signal.

The output multiplexer together with the Enable/Disable capabilities for the single encoder allows you to “build” the output TS with different combinations (1video+1audio, 2video+2audio, 1video+4 audio, see 2.3.1).

The PCR and audio clocks are locked to the input video clock.

In table 1 you can see the main characteristics of the EK-ENR/2.

Remember that in the standard configuration the EK-ENR/2 is supplied with:

- one electrical interface for SDI signal on the SFP3
- one electrical interface for Analog signal (PAL/NTSC) on the SFP4

For the audio connections please contact Eurotek for RJ45-to-XLR solutions.

Video Input	
Number of input	2
Connector	SFP module COAXIAL DIN 1.0/2.3
Type	SDI / Analog
Format	720x576 50i 720x480 59.94i 1920x1080 50i 1920x1080 59.94i 1920x1080 60i 1920x1080 24p 1920x1080 23.98p 1280x720 50p 1280x720 59.94p 1280x720 60p
Video Encoding	
Number of encoder	2
Standard	ISO/IEC 14496-10 (H.264/AVC) High Profile
Pixel Format	4:2:0, 8-bit, YCbCr
Bit Rate	2.0 ÷ 24.0 Mb/s
Audio Input	
Number of input	Analog: 4 mono balanced AES3: 2 stereo balanced and isolated from ground SDI audio embedded: 2
Connector	RJ-45 for analog/AES3 SFP module COAXIAL DIN 1.0/2.3 for SDI audio embedded
Audio Encoding	
Number of encoder	2
Standard	MPEG-1 Layer2, 2-channel
Number of channel	4 (2 encoder*2channel/encoder=4 channel)
Bit Rate	96,112,128,160,192,224,256,320,384 Kb/s
Output Transport Stream	
Type	MPEG2-TS conforming to ISO/IEC 13818-1
Climatic Condition	
Temperature	-5 ÷ +70 °C
Humidity	Max 90%
Altitude	3000 m 66KPa

**Table 1** – EK-ENR/2 Technical Specification

## 2. BOARD MENU

The EK-ENR/2 card may be configured by means both the EK-MFR/x keyboard or the MST Eurotek Software Suite, a PC based application (in the latter case you have to connect the PC via Ethernet to the EK-MFR/x).

In both cases the configuration is based on a number of variables that you can modify and that allow you a deep control over the card features.

These variables make the “card menu” and they are summarized figure 3.

In this figure you can see that there are 4 main menus:

- **Status:** here are reported the “read only” variables that show the status of the card (ie video state, temperature, an so on). See chapter 2.1.
- **Settings:** here you can find the “read/write” variables that allows you to modify the encoder functionality (ie enable/disable encoder, change the encoder bit rate or pid). See chapter 2.2.
- **Set Output:** in this menu you can change the output multiplexer bit rate and decide which TS send to the SFP output and to the internal output. See chapter 2.3.
- **Revision:** here are reported the software versions of the card. See chapter 2.4.

From the keyboard you can easily scroll through the menu by means the Up/Down and Enter/Esc buttons and change the values of the read/write variables with the same buttons.

From the MST software you can directly change the read/write variables writing the new value from the PC.

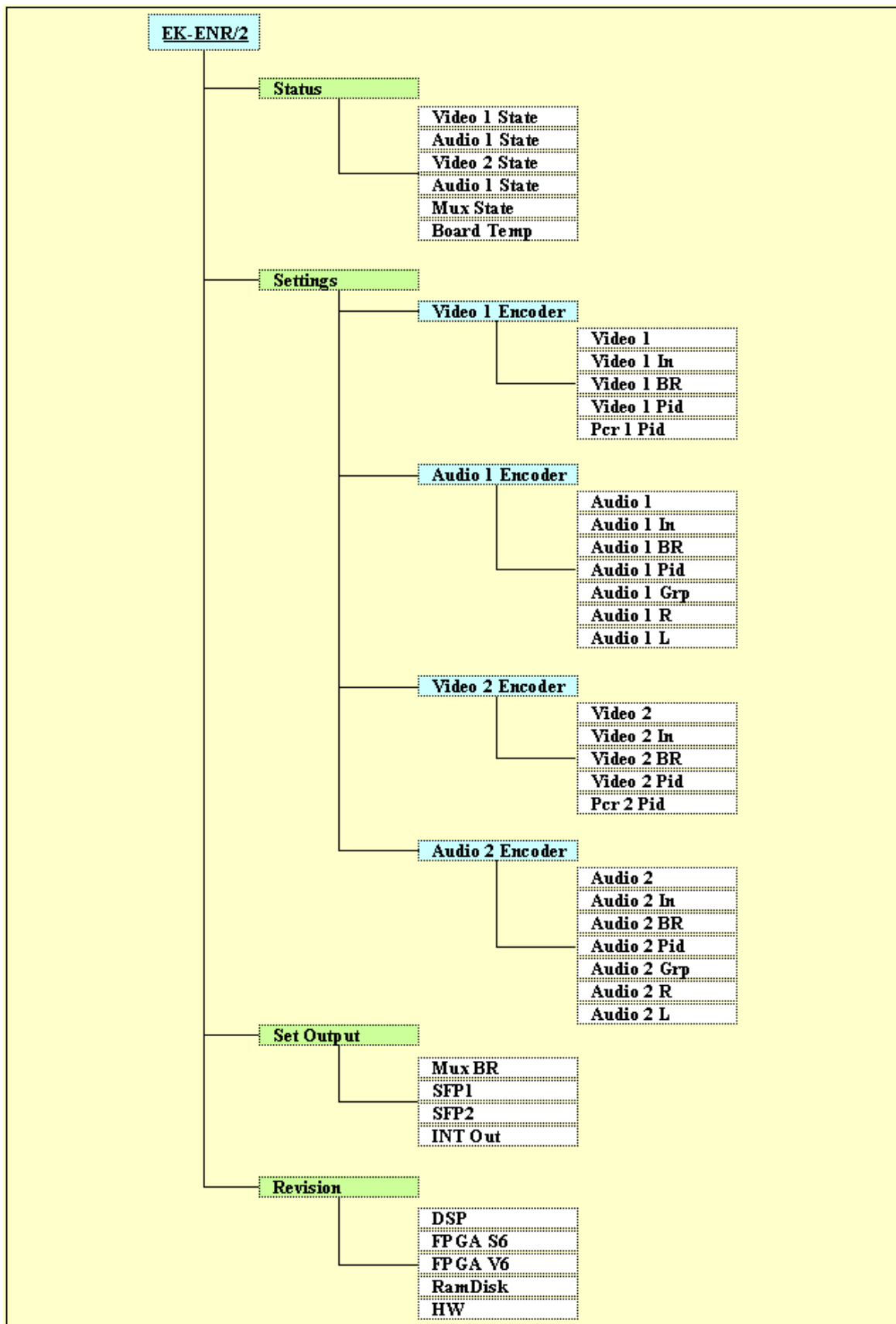


Figure 3 – EK-ENR/2 menu (on white background the variables)

## 2.1 STATUS MENU

In this menu are reported the “read only” variables that show you the state of the card.

Some variables may generate alarms when they go out of the boundary (ie too high temperature).

These alarms are reported on the screen of the mainframe and in the log alarm file (you can read this file by means the MST Eurotek Software Suite).

Below are explained the Status menu variables.

### 2.1.1 Status → Card State

This field is an hidden menu.

You can't see it neither on the display unit nor on the MST Eurotek Software Suite.

You can only see the alarms that are arised on this field:

- on the screen of the mainframe
- on the log alarm file (using the MST Eurotek Software Suite)

These alarms are reported on table 2.

Status → Card State	Alarm	Meaning
Setup 3	Yes	<p>You have set one of the following not allowed configurations:</p> <p>(Settings→Video 1 Encoder→Video 1 In==SFP4 ) &amp;&amp; (Settings→Video 2 Encoder→Video 2 In==Test HD)</p> <p>(Settings→Video 1 Encoder→Video 1 In==SFP4 ) &amp;&amp; (Settings→Video 2 Encoder→Video 2 In==Test SD)</p> <p>(Settings→Video 1 Encoder→Video 1 In==Test HD) &amp;&amp; (Settings→Video 2 Encoder→Video 2 In==SFP3 )</p> <p>(Settings→Video 1 Encoder→Video 1 In==Test SD) &amp;&amp; (Settings→Video 2 Encoder→Video 2 In==SFP3 )</p>

**Table 2** – "Status → Card State" hidden field

### 2.1.2 Status → Video 1 State

In this field the encoder 1 video input state is reported.

The possible voices in this field are reported in table 3; some of them may arise an alarm.

Status → Video 1 State	Alarm	Meaning
Disabled	No	The encoder 1 video packets are not allowed to go to the output mux
Video	Yes	Problem on encoder 1 video input
Boot	No	Problem during encoder 1 firmware booting
Start	No	Problem during encoder 1 configuration
Enc Warning	No	Generic problem on encoder 1
720x576 50i 720x480 59.94i 1920x1080 50i 1920x1080 59.94i 1920x1080 60i 1920x1080 24p 1920x1080 23.98p 1280x720 50p 1280x720 59.94p 1280x720 60p	No	The encoder 1 video input format

**Table 3** – "Status → Video 1 State" field

### 2.1.3 Status → Audio1 State

In this field the encoder 1 audio state is reported.

The possible voices in this field are reported in table 4; some of them may arise an alarm.

Status → Audio 1 State	Alarm	Meaning
Audio 1 / 2 In	Yes	You have set the same analog input on Audio 1 Encoder and Audio 2 Encoder. This configuration is not allowed.
Vid1/Aud1 In	Yes	You have set one of the following not allowed configurations:  (Settings→Video 1 Encoder→Video 1 In==Test HD) && (Settings→Audio 1 Encoder→Audio 1 In==SDI)  (Settings→Video 1 Encoder→Video 1 In==Test SD) && (Settings→Audio 1 Encoder→Audio 1 In==SDI)
Ok	No	Right audio configuration

**Table 4** – "Status → Audio 1 State" field

### 2.1.4 Status → Video 2 State

In this field the encoder 2 video input state is reported.

The possible voices in this field are reported in table 5; some of them may arise an alarm.

Status → Video 2 State	Alarm	Meaning
Disabled	No	The encoder 2 video packets are not present on the output mux
Video	Yes	Problem on encoder 2 video input
Boot	No	Problem during encoder 2 firmware booting
Start	No	Problem during encoder 2 configuration
Enc Warning	No	Generic problem on encoder 2
720x576 50i 720x480 59.94i 1920x1080 50i 1920x1080 59.94i 1920x1080 60i 1920x1080 24p 1920x1080 23.98p 1280x720 50p 1280x720 59.94p 1280x720 60p	No	The encoder 2 video input format

Table 5 – "Status → Video 1 State" field

### 2.1.5 Status → Audio 2 State

In this field the encoder 2 audio state is reported.

The possible voices in this field are reported in table 6; some of them may arise an alarm.

Status → Audio 2 State	Alarm	Meaning
Audio 1 / 2 In	Yes	You have set the same analog input on Audio 1 Encoder and Audio 2 Encoder. This configuration is not allowed.
Vid2/Aud2 In	Yes	You have set one of the following not allowed configurations:  (Settings→Video 2 Encoder→Video 2 In==Test HD) && (Settings→Audio 2 Encoder→Audio 2 In==SDI)  (Settings→Video 2 Encoder→Video 2 In==Test SD) && (Settings→Audio 2 Encoder→Audio 2 In==SDI)
Ok	No	Right audio configuration

Table 6 – "Status → Audio 1 State" field



### 2.1.6 Status → Mux State

In this field the status of the output transport stream multiplexer is reported.

As you can see in figure 2, this multiplexer adds the TSs from the encoders in order to have a single output TS. The alarms related to the multiplexer are reported in table 7.

Status → Mux State	Alarm	Meaning
Encoder1	Yes	The multiplexer output bit rate is too low
Encoder2	Yes	The multiplexer output bit rate is too low

**Table 7** – "Status → Mux State" field

### 2.1.7 Status → Board Temp

In this field the board temperature in °C is reported (table 8).

Status → Board Temp	Alarm	Meaning
±xy.z	Yes	Board Temperature in °C Limits for alarm –20.0÷+70.0 °C

**Table 8** – "Status → Board Temp" field

## 2.2 SETTINGS MENU

In this menu are reported the “read/write” variables that allow you to configure the audio/video encoders.

There are 4 sub-menus, one for each encoder (Video 1 Encoder, Audio 1 Encoder, Video 2 Encoder, Audio 2 Encoder). Please refer to figure 2.

These variables basically allow you to choose the encoders input, set the encoders bit rate and enable their TS output. In this way you can build your own output TS.

Below are explained the Settings menu variables.

### 2.2.1 Settings → Video 1 Encoder → Video 1

This field allows you to enable/disable the video 1 TS packets from the multiplexer output (see table 9).

Settings → Video 1 Encoder → Video 1	Meaning
Enabled	The video 1 encoder TS packets are present on the mux output
Disabled	The video 1 encoder TS packets are not present on the mux output

**Table 9** – “Settings → Video 1 Encoder → Video 1” field

### 2.2.2 Settings → Video 1 Encoder → Video 1 In

This field allows you to select the video 1 encoder input source (see table 10).

Settings → Video 1 Encoder → Video 1 In	Meaning
SFP3	The video 1 encoder input is from SFP3
SFP4	The video 1 encoder input is from SFP4
Test HD	The video 1 encoder input is a <ul style="list-style-type: none"> <li>• 1920x1080 50i</li> </ul> test signal that changes every 5 seconds
Test SD	The video 1 encoder input is a <ul style="list-style-type: none"> <li>• 720x576 50i</li> </ul> test signal

**Table 10** – “Settings → Video 1 Encoder → Video 1 In” field

### 2.2.3 Settings → Video 1 Encoder → Video 1 BR

This field allows you to select the video 1 encoder elementary stream bit rate (see table 11).

Settings → Video 1 Encoder → Video 1 BR	Meaning
2.000 ÷ 24.000 Mb/s	The video 1 encoder elementary stream bit rate. The guaranteed bit rate respect the video format are [Mb/s]:
	720x576 50i 2.000 ÷ 10.000
	720x480 59.94i 2.000 ÷ 10.000
	1920x1080 50i 6.000 ÷ 24.000
	1920x1080 59.94i 6.000 ÷ 24.000
	1920x1080 60i 6.000 ÷ 24.000
	1280x720 50p 4.000 ÷ 24.000
	1280x720 59.94p 4.000 ÷ 24.000
	1280x720 60p 4.000 ÷ 24.000

**Table 11** – "Settings → Video 1 Encoder → Video 1 BR" field

The video 1 encoder transport stream bit rate may be calculated with the following (rounded up) formula (1):

$$(1) \quad TS\_bit\_rate = ES\_bit\_rate * 188/183$$

### 2.2.4 Settings → Video 1 Encoder → Video 1 Pid

This field allows you to set the video 1 encoder TS packets PID (see table 12).

Settings → Video 1 Encoder → Video 1 Pid	Meaning
35 ÷ 8190	The video 1 encoder TS packets allowed PID

**Table 12** – "Settings → Video 1 Encoder → Video 1 Pid" field

### 2.2.5 Settings → Video 1 Encoder → Video 1 Pcr

This field allows you to set the PCR packets PID for the encoder 1 (see table 13).

The PCR PID MUST BE different from the Video PID 1 and from the Audio 1 PID

Settings → Video 1 Encoder → Pcr 1 Pid	Meaning
35 ÷ 8190	The encoder 1 PCR TS packets allowed PID

**Table 13** – "Settings → Video 1 Encoder → Pcr 1 Pid" field

## 2.2.6 Settings → Audio 1 Encoder → Audio 1

This field allows you to enable/disable the audio TS packets from the multiplexer output (see table 14).

Settings → Audio 1 Encoder → Audio 1	Meaning
Enabled	The audio 1 encoder TS packets are present on the mux output
Disabled	The audio 1 encoder TS packets are not present on the mux output

**Table 14** – "Settings → Audio 1 Encoder → Audio 1" field

## 2.2.7 Settings → Audio 1 Encoder → Audio 1 In

This field allows you to select the audio 1 encoder input source (see table 15).

Settings → Audio 1 Encoder → Audio 1 In	Meaning
SDI	The audio 1 encoder input is sourced from the audio embedded inside the SDI signal that feeds the video 1 encoder
Analog 1	The audio 1 encoder input is sourced from the analog input 1
Analog 2	The audio 1 encoder input is sourced from the analog input 2
AES3 1	The audio 1 encoder input is sourced from the AES3 input 1
Test	The audio 1 encoder input is a 1KHz tone
Mute	The audio 1 encoder input is muted

**Table 15** – "Settings → Audio 1 Encoder → Audio 1 In" field

### 2.2.8 Settings → Audio 1 Encoder → Audio 1 BR

This field allows you to select the audio 1 encoder elementary stream bit rate (see table 16).

In table 16 you can also see the audio 1 encoder transport stream bit rate for each selected elementary stream bit rate.

Settings → Audio 1 Encoder → Audio 1 BR	Meaning	
96, 112, 128, 160, 192, 224, 256, 320, 384 Kb/s	The audio 1 encoder elementary stream bit rate. Below the TS bit rate for each ES bit rate	
	ES Bit Rate	TS Bit Rate
	96 Kb/s	125 Kb/s
	112 Kb/s	125 Kb/s
	128 Kb/s	188 Kb/s
	160 Kb/s	188 Kb/s
	192 Kb/s	250 Kb/s
	224 Kb/s	250 Kb/s
	256 Kb/s	313 Kb/s
	320 Kb/s	376 Kb/s
	384 Kb/s	438 Kb/s

**Table 16** – "Settings → Audio 1 Encoder → Audio 1 BR" field

### 2.2.9 Settings → Audio 1 Encoder → Audio 1 Pid

This field allows you to set the audio 1 encoder TS packets PID (see table 17).

Settings → Audio 1 Encoder → Audio 1 Pid	Meaning
35 ÷ 8190	The audio 1 encoder TS packets allowed PID

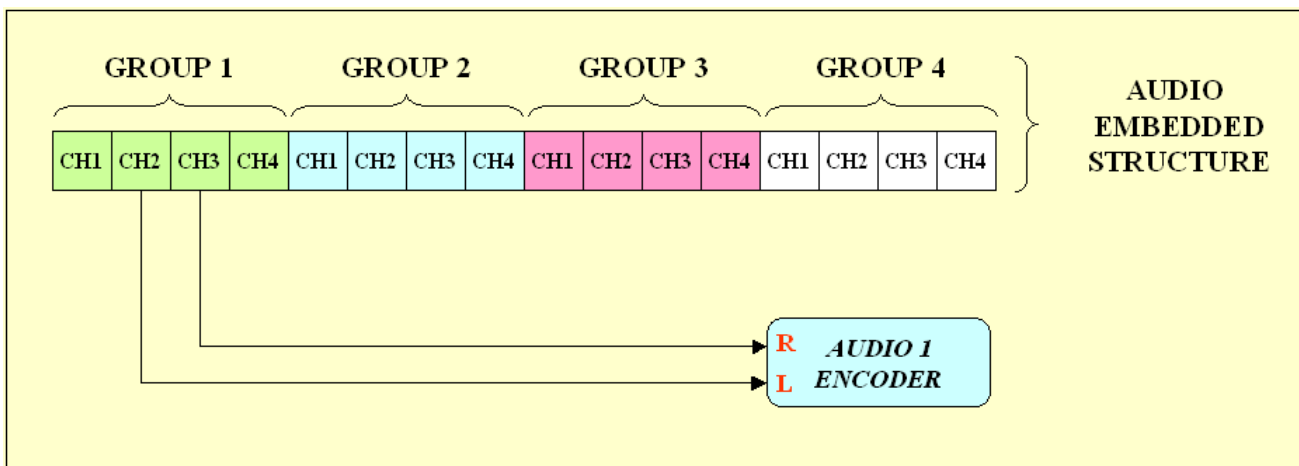
**Table 17** – "Settings → Audio 1 Encoder → Audio 1 Pid" field

**2.2.10 Settings → Audio 1 Encoder → Audio 1 Grp**

This field is used only when you select SDI as Audio 1 In (see 2.2.7). In this case the audio 1 encoder input will be feed with two signals that may be chosen between up to 16 different signals coming from the audio embedded in the selected encoder 1 video input (see 2.2.2).

As you can see in figure 4, the audio embedded in the SDI video signal carries up to 16 audio channels, divided in 4 groups with 4 channels for each group.

You have to choose an audio group and inside this group the 2 channels that will feed the audio 1 encoder input. In figure 4, for example, the channels 2 and 3 inside the audio group 1 have been chosen for feeding the audio 1 encoder.



**Figure 4** – Audio embedded structure

This “Settings→Audio 1 Encoder→Audio 1 Grp” field allows you to select the audio group in the SDI audio embedded signal (see table 18).

Settings → Audio 1 Encoder → Audio 1 Grp	Meaning
GROUP1, GROUP2, GROUP3, GROUP4	Selects the audio group inside the SDI audio embedded for feeding the audio 1 encoder

**Table 18** – “Settings → Audio 1 Encoder → Audio 1 Grp” field

### 2.2.11 Settings → Audio 1 Encoder → Audio 1 R

This field is used only when you select SDI as Audio 1 In (see 2.2.7) and it allows you to select which audio channel in the selected audio group will feed the audio 1 encoder right input (see table 19).

<b>Settings → Audio 1 Encoder → Audio 1 R</b>	<b>Meaning</b>
CH1, CH2, CH3, CH4	Selects the audio 1 encoder right input inside the SDI embedded audio group

**Table 19** – "Settings → Audio 1 Encoder → Audio 1 R" field

### 2.2.12 Settings → Audio 1 Encoder → Audio 1 L

This field is used only when you select SDI as Audio 1 In (see 2.2.7) and it allows you to select which audio channel in the selected audio group will feed the audio 1 encoder left input (see table 20).

<b>Settings → Audio 1 Encoder → Audio 1 L</b>	<b>Meaning</b>
CH1, CH2, CH3, CH4	Selects the audio 1 encoder left input inside the SDI embedded audio group

**Table 20** – "Settings → Audio 1 Encoder → Audio 1 L" field

### 2.2.13 Settings → Video 2 Encoder → Video 2

This field allows you to enable/disable the video 2 TS packets from the multiplexer output (see table 21).

Settings → Video 2 Encoder → Video 2	Meaning
Enabled	The video 2 encoder TS packet are present on the mux output
Disabled	The video 2 encoder TS packet are not present on the mux output

Table 21 – "Settings → Video 2 Encoder → Video 2" field

### 2.2.14 Settings → Video 2 Encoder → Video 2 In

This field allows you to select the video 2 encoder input source (see table 22).

Settings → Video 2 Encoder → Video 2 In	Meaning
SFP3	The video 2 encoder input is from SFP3
SFP4	The video 2 encoder input is from SFP4
Test HD	The video 2 encoder input is a <ul style="list-style-type: none"> <li>• 1920x1080 50i</li> </ul> test signal that changes every 5 seconds
Test SD	The video 2 encoder input is a <ul style="list-style-type: none"> <li>• 720x576 50i</li> </ul> test signal

Table 22 – "Settings → Video 2 Encoder → Video 2 In" field



### 2.2.15 Settings → Video 2 Encoder → Video 2 BR

This field allows you to select the video 2 encoder elementary stream bit rate (see table 23).

Settings → Video 2 Encoder → Video 2 BR	Meaning																								
2.000 ÷ 24.000 Mb/s	<p>The video 2 encoder elementary stream bit rate. The guaranteed bit rate respect the video format are [Mb/s]:</p> <table border="0"> <tr> <td>720x576</td> <td>50i</td> <td>2.000 ÷ 10.000</td> </tr> <tr> <td>720x480</td> <td>59.94i</td> <td>2.000 ÷ 10.000</td> </tr> <tr> <td>1920x1080</td> <td>50i</td> <td>6.000 ÷ 24.000</td> </tr> <tr> <td>1920x1080</td> <td>59.94i</td> <td>6.000 ÷ 24.000</td> </tr> <tr> <td>1920x1080</td> <td>60i</td> <td>6.000 ÷ 24.000</td> </tr> <tr> <td>1280x720</td> <td>50p</td> <td>4.000 ÷ 24.000</td> </tr> <tr> <td>1280x720</td> <td>59.94p</td> <td>4.000 ÷ 24.000</td> </tr> <tr> <td>1280x720</td> <td>60p</td> <td>4.000 ÷ 24.000</td> </tr> </table>	720x576	50i	2.000 ÷ 10.000	720x480	59.94i	2.000 ÷ 10.000	1920x1080	50i	6.000 ÷ 24.000	1920x1080	59.94i	6.000 ÷ 24.000	1920x1080	60i	6.000 ÷ 24.000	1280x720	50p	4.000 ÷ 24.000	1280x720	59.94p	4.000 ÷ 24.000	1280x720	60p	4.000 ÷ 24.000
720x576	50i	2.000 ÷ 10.000																							
720x480	59.94i	2.000 ÷ 10.000																							
1920x1080	50i	6.000 ÷ 24.000																							
1920x1080	59.94i	6.000 ÷ 24.000																							
1920x1080	60i	6.000 ÷ 24.000																							
1280x720	50p	4.000 ÷ 24.000																							
1280x720	59.94p	4.000 ÷ 24.000																							
1280x720	60p	4.000 ÷ 24.000																							

**Table 23** – "Settings → Video 2 Encoder → Video 2 BR" field

The video 2 encoder transport stream bit rate may be calculated with the following (rounded up) formula (2)

$$(2) \quad TS\_bit\_rate = ES\_bit\_rate * 188/183$$

### 2.2.16 Settings → Video 2 Encoder → Video 2 Pid

This field allows you to set the video 2 encoder TS packets PID (see table 24).

Settings → Video 2 Encoder → Video 2 Pid	Meaning
35 ÷ 8190	The video 2 encoder TS packets allowed PID

**Table 24** – "Settings → Video 2 Encoder → Video 2 Pid" field

### 2.2.17 Settings → Video 2 Encoder → Video 2 Pcr

This field allows you to set the PCR packets PID for the encoder 2 (see table 25).

The PCR PID MUST BE different from the Video 2 PID and from the Audio 2 PID.

Settings → Video 2 Encoder → Pcr 2 Pid	Meaning
35 ÷ 8190	The encoder 2 PCR TS packets allowed PID

**Table 25** – "Settings → Video 2 Encoder → Pcr 2 Pid" field

### 2.2.18 Settings → Audio 2 Encoder → Audio 2

This field allows you to enable/disable the audio TS packets from the multiplexer output (see table 26).

Settings → Audio 2 Encoder → Audio 2	Meaning
Enabled	The audio 2 encoder TS packets are present on the mux output
Disabled	The audio 2 encoder TS packets are not present on the mux output

**Table 26** – "Settings → Audio 2 Encoder → Audio 2" field

### 2.2.19 Settings → Audio 2 Encoder → Audio 2 In

This field allows you to select the audio 2 encoder input source (see table 27).

Settings → Audio 2 Encoder → Audio 2 In	MEANING
SDI	The audio 2 encoder input is sourced from the audio embedded inside the SDI signal that feeds the video 2 encoder
Analog 1	The audio 2 encoder input is sourced from the analog input 1
Analog 2	The audio 2 encoder input is sourced from the analog input 2
AES3 1	The audio 2 encoder input is sourced from the AES3 input 1
Test	The audio 2 encoder input is a 1KHz tone
Mute	The audio 2 encoder input is muted

**Table 27** – "Settings → Audio 2 Encoder → Audio 2 In" field

### 2.2.20 Settings → Audio 2 Encoder → Audio 2 BR

This field allows you to select the audio 2 encoder elementary stream bit rate (see table 28).

In table 28 you can also see the audio 2 encoder transport stream bit rate for each selected elementary stream bit rate.

Settings → Audio 2 Encoder → Audio 2 BR	Meaning	
96, 112, 128, 160, 192, 224, 256, 320, 384 Kb/s	The audio 2 encoder elementary stream bit rate. Below the TS bit rate for each ES bit rate	
	ES Bit Rate	TS Bit Rate
	96 Kb/s	125 Kb/s
	112 Kb/s	125 Kb/s
	128 Kb/s	188 Kb/s
	160 Kb/s	188 Kb/s
	192 Kb/s	250 Kb/s
	224 Kb/s	250 Kb/s
	256 Kb/s	313 Kb/s
	320 Kb/s	376 Kb/s
	384 Kb/s	438 Kb/s

**Table 28** – "Settings → Audio 2 Encoder → Audio 2 BR" field

### 2.2.21 Settings → Audio 2 Encoder → Audio 2 Pid

This field allows you to set the audio 2 encoder TS packets PID (see table 29).

Settings → Audio 2 Encoder → Audio 2 Pid	Meaning
35 ÷ 8190	The audio 2 encoder TS packets allowed PID

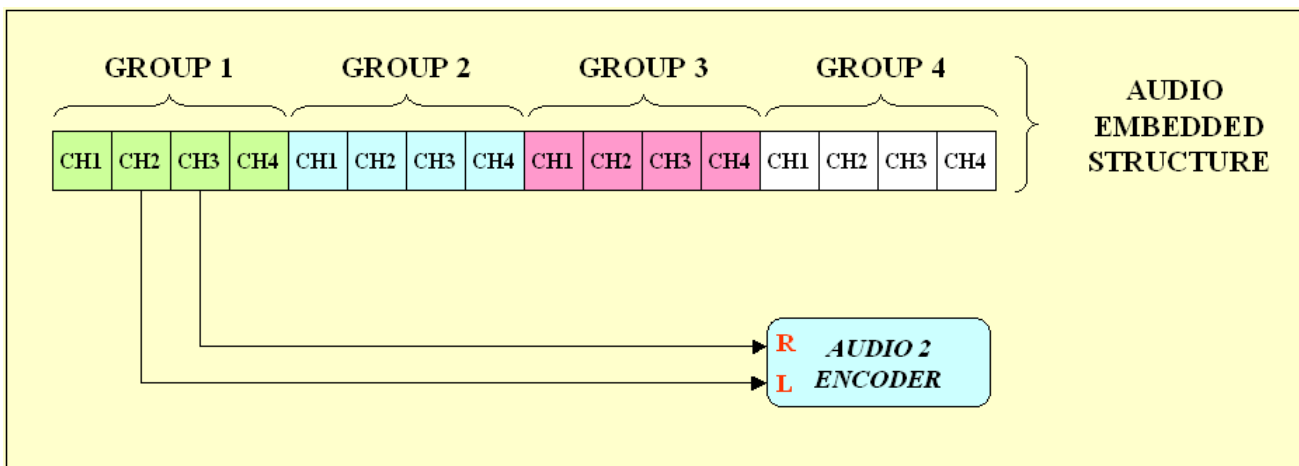
**Table 29** – "Settings → Audio 2 Encoder → Audio 2 Pid" field

**2.2.22 Settings → Audio 2 Encoder → Audio 2 Grp**

This field is used only when you select SDI as Audio 2 In (see 2.2.19). In this case the audio 2 encoder input will be feed with two signals that may be chosen between up to 16 different signals coming from the audio embedded in the selected encoder 2 video input (see 2.2.14).

As you can see in figure 5, the audio embedded in the SDI video signal carries up to 16 audio channels, divided in 4 groups with 4 channels for each group.

You have to choose an audio group and inside this group the 2 channels that will feed the audio 2 encoder input. In figure 5, for example, the channels 2 and 3 inside the audio group 1 have been chosen for feeding the audio 2 encoder.



**Figure 5** – Audio embedded structure

This “Settings→Audio 2 Encoder→Audio 2 Grp” field allows you to select the audio group in the SDI audio embedded signal (see table 30).

Settings → Audio 2 Encoder → Audio 2 Grp	Meaning
GROUP1, GROUP2, GROUP3, GROUP4	Selects the audio group inside the SDI audio embedded for feeding the audio 2 encoder

**Table 30** – “Settings → Audio 2 Encoder → Audio 2 Grp” field

### 2.2.23 Settings → Audio 2 Encoder → Audio 2 R

This field is used only when you select SDI as Audio 2 In (see 2.2.19) and it allows you to select which audio channel in the selected audio group will feed the audio 2 encoder right input (see table 31).

Settings → Audio 2 Encoder → Audio 2 R	Meaning
CH1, CH2, CH3, CH4	Selects the audio 2 encoder right input inside the SDI embedded audio group

**Table 31** – "Settings → Audio 2 Encoder → Audio 2 R" field

### 2.2.24 Settings → Audio 2 Encoder → Audio 2 L

This field is used only when you select SDI as Audio 2 In (see 2.2.19) and it allows you to select which audio channel in the selected audio group will feed the audio 2 encoder left input (see table 32).

Settings → Audio 2 Encoder → Audio 2 L	Meaning
CH1, CH2, CH3, CH4	Selects the audio 2 encoder left input inside the SDI embedded audio group

**Table 32** – "Settings → Audio 2 Encoder → Audio 2 L" field

## **2.3 Set output menu**

In this menu are reported the “read/write” variables that allow you to configure the output multiplexer bit rate and to choose which TS signal put to the SFP1, SFP2 and internal outputs. Please refer to figure 2.

Below are explained the Set Output menu variables.

### **2.3.1 Set Output → Mux BR**

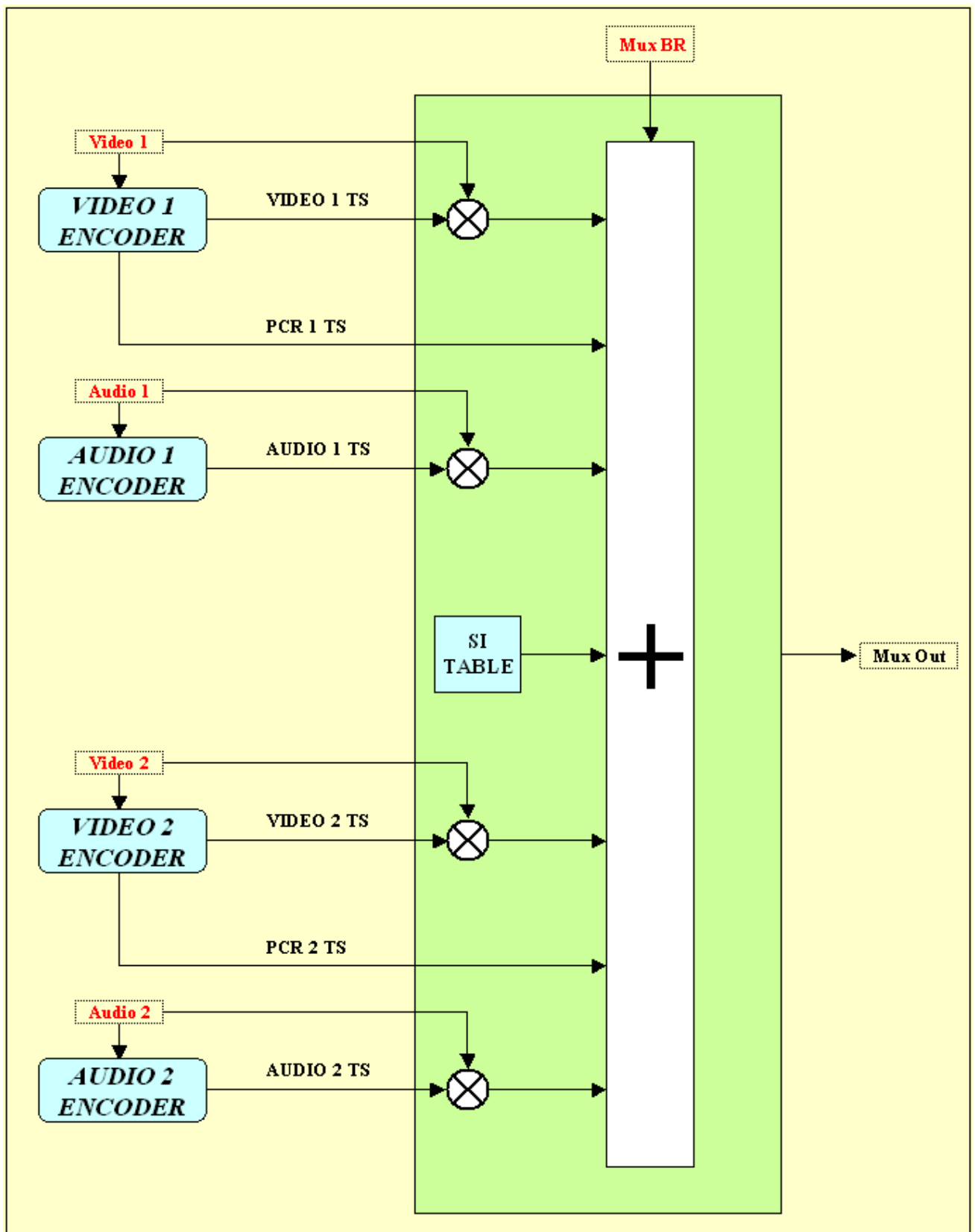
This field is used only when you select “Mux Out” on SFP1 (see 2.3.2) , on SFP2 (see 2.3.3) or on INT Out (see 2.3.4). The output multiplexer is used to build a single output TS adding the TSs coming from the audio/video encoders (see figure 2).

This field is used to set the multiplexer output bit rate (see table 33).

<b>Set Output → Mux BR</b>	<b>Meaning</b>
0.100 ÷ 215.000 Mb/s	Set the output multiplexer bit rate

**Table 33** – “Set Output → Mux BR” field

By using the Video 1/Audio 1/Video 2/Audio 2 fields you are able to “build” your own output TS, allowing the audio/video TS to pass through the multiplexer towards the output (see figure 6).



**Figure 6** – The output multiplexer structure

In table 34 are reported the possible combinations that you have for the output TS in function of the Video 1/Audio 1/Video 2/Audio 2 fields.

In figure 6 you can also see that the multiplexer adds the si tables to the output TS. The added tables are the PAT and the PMTs and are present only in some cases that are reported in table 34.

Settings → Videox/Audiox →				Mux Out TS	SI Table
Video 1	Audio 1	Video 2	Audio 2		
Disabled	Disabled	Disabled	Disabled	Only stuffing	No
Disabled	Disabled	Disabled	Enabled	Not Available	No
Disabled	Disabled	Enabled	Disabled	Not Available	No
Disabled	Disabled	Enabled	Enabled	Not Available	No
Disabled	Enabled	Disabled	Disabled	0 Video + 1 Audio + 1 PCR	No
Disabled	Enabled	Disabled	Enabled	0 Video + 2 Audio + 2 PCR	No
Disabled	Enabled	Enabled	Disabled	Not Available	No
Disabled	Enabled	Enabled	Enabled	1 Video + 2 Audio + 2 PCR	No
Enabled	Disabled	Disabled	Disabled	1 Video + 0 Audio + 1 PCR	No
Enabled	Disabled	Disabled	Enabled	Not Available	No
Enabled	Disabled	Enabled	Disabled	2 Video + 0 Audio + 2 PCR	No
Enabled	Disabled	Enabled	Enabled	Not Available	No
Enabled	Enabled	Disabled	Disabled	1 Video + 1 Audio + 1 PCR	No
<b>Enabled</b>	<b>Enabled</b>	<b>Disabled</b>	<b>Enabled</b>	<b>1 Video + 2 Audio + 2 PCR</b>	<b>Yes</b>
Enabled	Enabled	Enabled	Disabled	Not Available	No
<b>Enabled</b>	<b>Enabled</b>	<b>Enabled</b>	<b>Enabled</b>	<b>2 Video + 2 Audio + 2 PCR</b>	<b>Yes</b>

**Table 34** – Allowed combination for output multiplexer



The minimum multiplexer output bit rate is a function of:

- the bit rate of the enabled audio/video encoder
- the presence of the output tables

and may be calculated by means the formula (3).

In this formula the 1.05 factor is a 5% margin needed to the multiplexer.

$$(3) \quad \text{Set Output} \rightarrow \text{Mux BR} \geq \left\{ \begin{array}{l} [\text{Vbr}(1) \times \text{Ve}(1)] + [\text{Abr}(1) \times \text{Ae}(1)] + [\text{Pbr}(1) \times \text{Pe}(1)] + \\ [\text{Vbr}(2) \times \text{Ve}(2)] + [\text{Abr}(2) \times \text{Ae}(2)] + [\text{Pbr}(2) \times \text{Pe}(2)] + \\ [\text{PATbr} + \text{PMTbr} + \text{PMTbr}] \times \text{Sle} \\ \end{array} \right\} \times 1.05$$

where:

- $\text{Vbr}(1) = [\text{Settings} \rightarrow \text{Video 1 Encoder} \rightarrow \text{Video 1 BR}] \times 188/183$  [Mb/s]
- $\text{Ve}(1) = 1$  if [Settings→Video 1 Encoder→Video 1==Enabled] else 0
- $\text{Abr}(1) =$  from table 16 [Mb/s]
- $\text{Ae}(1) = 1$  if [Settings→Audio 1 Encoder→Audio 1==Enabled] else 0
- $\text{Pbr}(1) = 0.050$  Mb/s [PCR bit rate of encoder 1]
- $\text{Pe}(1) = 1$  if {[Ve(1)==1] || [Ae(1)==1]} else 0
- $\text{Vbr}(2) = [\text{Settings} \rightarrow \text{Video 2 Encoder} \rightarrow \text{Video 2 BR}] \times 188/183$  [Mb/s]
- $\text{Ve}(2) = 1$  if [Settings→Video 2 Encoder→Video 2==Enabled] else 0
- $\text{Abr}(2) =$  from table 16 [Mb/s]
- $\text{Ae}(2) = 1$  if [Settings→Audio 2 Encoder→Audio 2==Enabled] else 0
- $\text{Pbr}(2) = 0.050$  Mb/s [PCR bit rate of encoder 2]
- $\text{Pe}(2) = 1$  if {[Ve(2)==1] || [Ae(2)==1]} else 0
- $\text{PATbr} = 0.015$  Mb/s [PAT bit rate]
- $\text{PMTbr} = 0.015$  Mb/s [PMT bit rate]
- $\text{Sle} = 1$  if [SI Table==Yes in table 34] else 0

For example if we want one 8.0 Mb/s video and two 256 Kb/s audio with tables at the output, we have to set a minimum Mux BR of:

$$\left\{ \begin{array}{l} [8.0 \times 188/183 \times 1] + [0.313 \times 1] + [0.050 \times 1] + \\ [0 \times 188/183 \times 0] + [0.313 \times 1] + [0.050 \times 1] + \\ [0.015 + 0.015 + 0.015] \times 1 \\ \end{array} \right\} \times 1.05 = 9.440 \text{ Mb/s}$$

### 2.3.2 Set Output → SFP1

This field allows you to select which TS send on the SFP1 output connector.

The possible choices are reported in table 35.

Set Output → SFP1	MEANING
Mux Out	The output of the internal multiplexer
Enc1 Out	The output of the encoder 1
Enc2 Out	The output of the encoder 2
SFP 1 In	The TS present on SFP 1 input
SFP 2 In	The TS present on SFP 2 input
INT 1 In	The TS present on internal input 1
INT 2 In	The TS present on internal input 2

**Table 35** – "Set Output → SFP1" field

Please note that if you select:

- Enc1 Out and at least one of the Audio1 or Video1 is enabled, on the output will be present both audio1/video1 TSs packet.
- Enc2 Out and at least one of the Audio2 or Video2 is enabled, on the output will be present both audio2/video2 TSs packet.

The internal inputs "INT1 In" and "INT2 In" are connected to the EK-MFR/x bus and they take the TS arriving from any other card that can be plugged into the same EK-MFR/x and that can give an output TS on the internal bus.

Please refer to figure 7 for the routing possibility of the card.

In this figure you can see the EK-MFR/x interconnection matrix that allows you to route the TSs between the cards (up to 6 cards, card 1 and card 2 in the figure) plugged into the frame without using external cables.

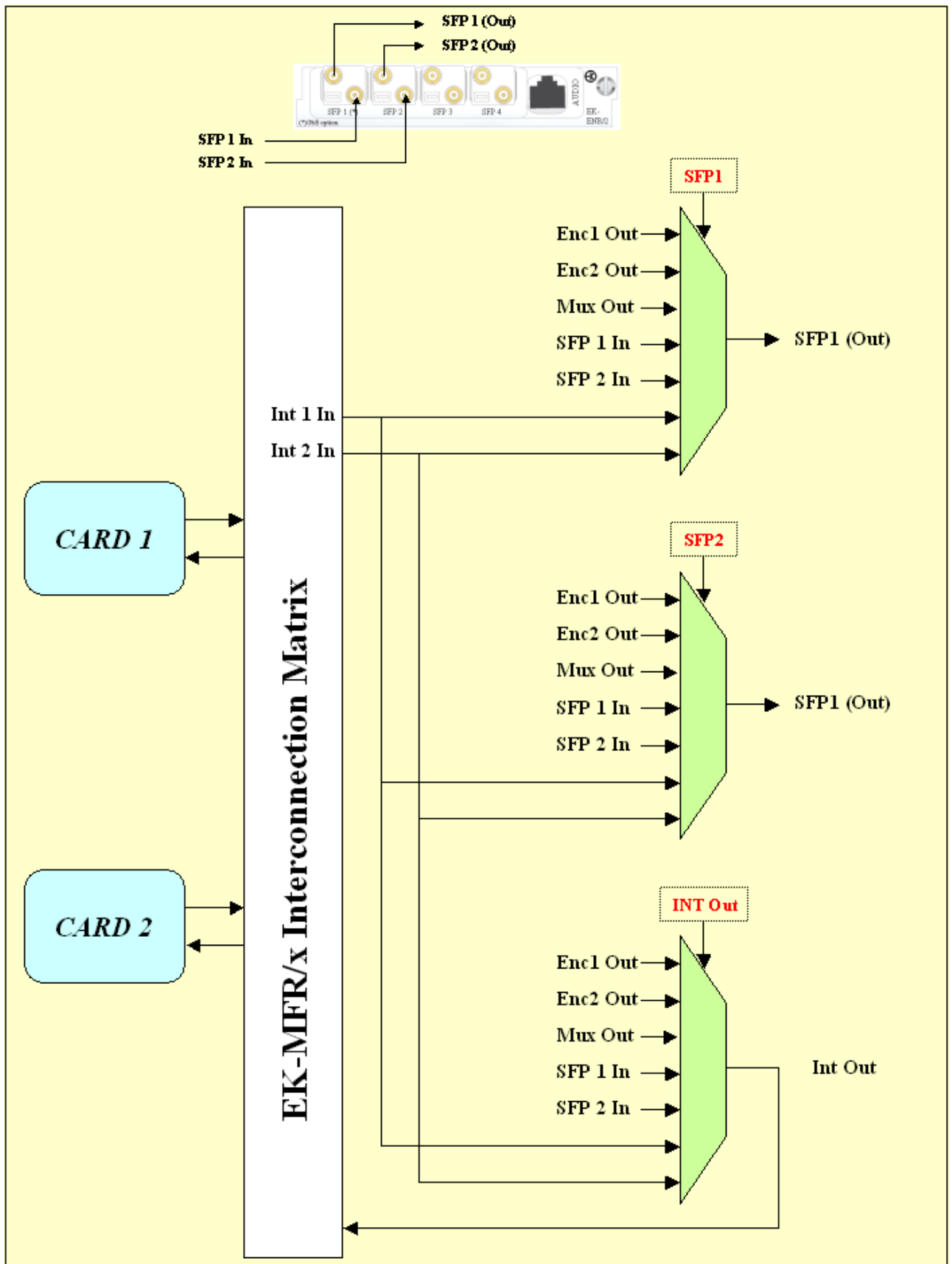


Figure 7 – The output signals

### 2.3.3 Set Output → SFP2

This field allows you to select which TS send on the SFP2 output connector.

The possible choices are reported in table 36.

Set Output → SFP2	MEANING
Mux Out	The output of the internal multiplexer
Enc1 Out	The output of the encoder 1
Enc2 Out	The output of the encoder 2
SFP 1 In	The TS present on SFP 1 input
SFP 2 In	The TS present on SFP 2 input
INT 1 In	The TS present on internal input 1
INT 2 In	The TS present on internal input 2

**Table 36** – "Set Output → SFP2" field

Please note that if you select:

- Enc1 Out and at least one of the Audio1 or Video1 is enabled, on the output will be present both audio1/video1 TSs packet.
- Enc2 Out and at least one of the Audio2 or Video2 is enabled, on the output will be present both audio2/video2 TSs packet.

The internal inputs "INT1 In" and "INT2 In" are connected to the EK-MFR/x bus and they take the TS arriving from any other card that can be plugged into the same EK-MFR/x and that can give an output TS on the internal bus.

Please refer to figure 7 for the routing possibility of the card.

In this figure you can see the EK-MFR/x interconnection matrix that allows you to route the TSs between the cards (up to 6 cards, card 1 and card 2 in the figure) plugged into the frame without using external cables.

### 2.3.4 Set Output → INT Out

This field allows you to select which TS send on the internal output.

The possible choices are reported in table 37.

Set Output → INT Out	MEANING
Mux Out	The output of the internal multiplexer
Enc1 Out	The output of the encoder 1
Enc2 Out	The output of the encoder 2
SFP 1 In	The TS present on SFP 1 input
SFP 2 In	The TS present on SFP 2 input
INT 1 In	The TS present on internal input 1
INT 2 In	The TS present on internal input 2

**Table 37** – "Set Output → INT Out" field

Please note that if you select:

- Enc1 Out and at least one of the Audio1 or Video1 is enabled, on the output will be present both audio1/video1 TSs packet.
- Enc2 Out and at least one of the Audio2 or Video2 is enabled, on the output will be present both audio2/video2 TSs packet.

The internal inputs "INT1 In" and "INT2 In" are connected to the EK-MFR/x bus and they take the TS arriving from any other card that can be plugged into the same EK-MFR/x and that can give an output TS on the internal bus.

Please refer to figure 7 for the routing possibility of the card.

In this figure you can see the EK-MFR/x interconnection matrix that allows you to route the TSs between the cards (up to 6 cards, card 1 and card 2 in the figure) plugged into the frame without using external cables.

## **2.4 Revision menu**

In this menu are reported the software revisions loaded on the card.

### **2.4.1 Revision → DSP**

This field reports the revision loaded on the microcontroller present on the board (see table 38).

<b>Revision → DSP</b>	<b>Meaning</b>
10.027	Microcontroller software revision

**Table 38** – "Revision → DSP" field

### **2.4.2 Revision → FPGA S6**

This field reports the revision loaded on the first FPGA present on the board (see table 39).

<b>Revision → FPGA S6</b>	<b>Meaning</b>
10.008	First FPGA software revision

**Table 39** – "Revision → FPGA S6" field

### **2.4.3 Revision → FPGA V6**

This field reports the revision loaded on the second FPGA present on the board (see table 40).

<b>Revision → FPGA V6</b>	<b>Meaning</b>
2.034	Second FPGA software revision

**Table 40** – "Revision → FPGA V6" field

### **2.4.4 Revision → RamDisk**

This field reports the revision of a custom software possibly present on the board (see table 41).

<b>Revision → RamDisk</b>	<b>Meaning</b>
1.0	Custom card software revision

**Table 41** – "Revision → RamDisk" field

### **2.4.5 Revision → HW**

This field reports the revision hardware revision of the board (see table 42).

<b>Revision → HW</b>	<b>Meaning</b>
C.F	Card hardware revision

**Table 42** – "Revision → HW" field

### 3. AUDIO RJ-45 CONNECTIONS

In the table 43 you can see the audio RJ-45 connector pin out.

The output audio signals are all balanced.

For the audio connections please contact Eurotek for RJ45-to-XLR solutions.

RJ-45 PIN	Analog audio	AES audio
1	AUDIO 2 LEFT N	
2	AUDIO 2 LEFT P	
3	AUDIO 2 RIGHT N	AUDIO 2 AES N
4	AUDIO 1 LEFT N	AUDIO 1 AES N
5	AUDIO 1 LEFT P	AUDIO 1 AES P
6	AUDIO 2 RIGHT P	AUDIO 2 AES P
7	AUDIO 1 RIGHT N	
8	AUDIO 1 RIGHT P	
9	SHIELD GND	SHIELD GND
10	SHIELD GND	SHIELD GND

**Table 43** – RJ-45 connector pin out

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