

3G/HD/SD SDI 16ch embedder/de-embedder
with video delay and VANC Dolby Metadata

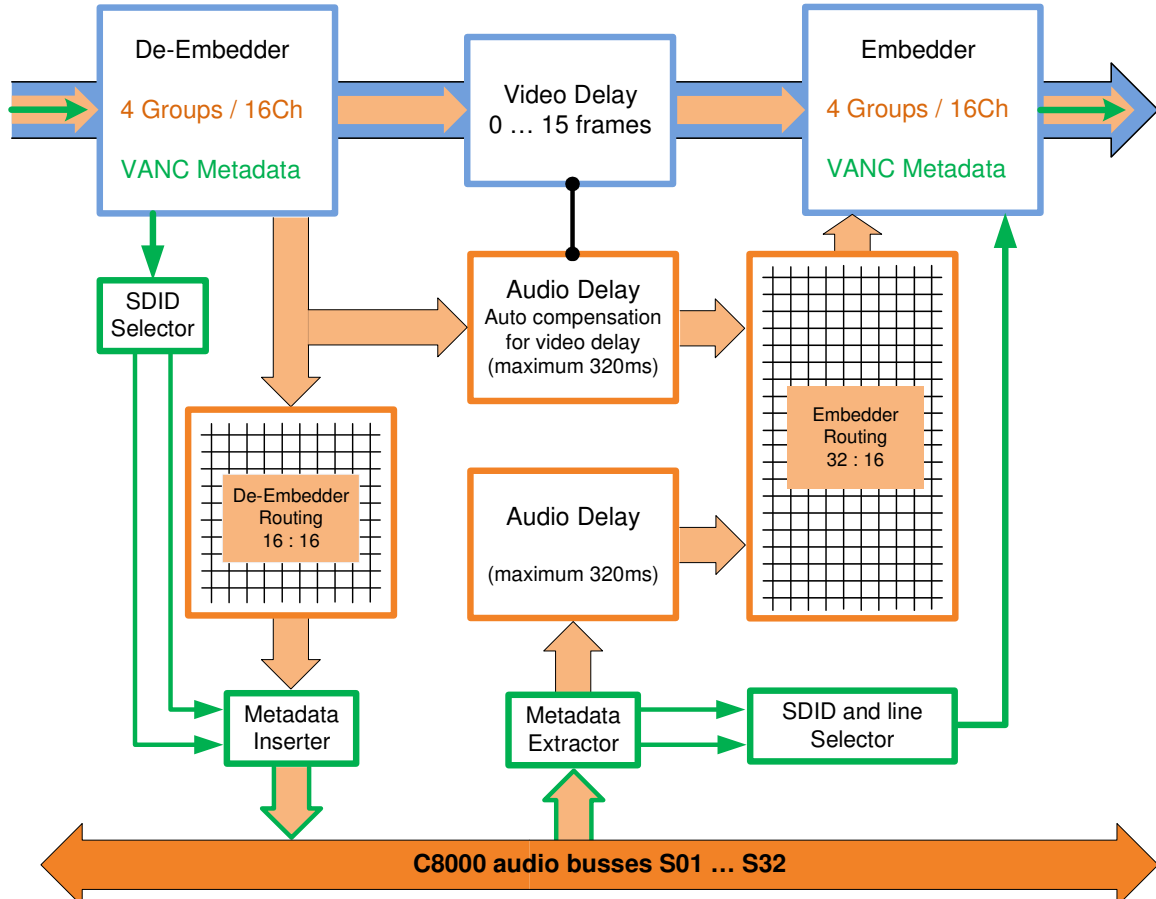
C8405

features

- BNC connectors : **IN, THROUGH** (active loop, re-clocked), **OUT1, OUT2**
- Bypass relay : connects SDI IN to SDI OUT1 for **fail save operation**
remote control via web interface and/or GPI
- De-Embedder :
auto detection of **3G / HD / SD SDI**
4 groups / 16 channels simultaneously
silence source
two **VANC** Dolby Metadata streams
- Embedder :
4 groups / 16 channels simultaneously
silence source
two **VANC** Dolby Metadata streams
- Video delay : up to 15 frames
- Audio delay : 16 x 320 ms for signals from c8k audio busses
automatic compensation of video delay for pass through audio
(from de-embedder to embedder) but limited to 320ms
- Bit transparent : for coded data streams (e.g. Dolby E)
- Video Generator : color bars or black
- Remote control : on/off manually or automatically if the input signal is lost
via C8702 frame controller
- Master mode : C8405 may deliver the clocks for the C8k Frame



block diagram



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technical specifications

Standards	Video complies with SMPTE 424/425M (3G, Level A and B), SMPTE 292M (HD) or SMPTE 259M (SD). Automatic format detection. Audio embedding and de-embedding complies with SMPTE 299M (3G, HD) or SMPTE 272M-AC (SD). Metadata embedding and de-embedding complies with SMPTE 2020-2.	
Video Data Rate	2970/296Mbps (3G), 1485/1483.5Mbps (HD), 270Mbps (SD)	
Video Formats	1080p23.975, 24, 25, 29.97, 30, 50, 59.94, 60 1080i50, 59.94, 60 720p23.975, 24, 25, 29.97, 30, 50, 59.94, 60 625i50, 525i59.94, ...	
Video Delay	User selectable 0 ... 15frames	
Audio	24bits, transparent forwarding of PCM and compressed audio	
Audio Channels	16 inputs and 16 outputs (4 groups with 4 channels each)	
Audio Sample Rate	48kHz (SDI compliant)	
Audio Delay	Embedder audio delay selectable 0 ... 320ms per channel	
Metadata (RDD6)	1 channel input and 1 channel output, SDID selectable	
BNC Input	Impedance	75Ohm
	Return loss	> 15dB, 5 ... 1485MHz > 10dB, 1485 ... 2970MHz
	Cable length (max.)	250m @ SD for Belden 1694A cable 230m @ HD for Belden 1694A cable 140m @ 3G for Belden 1694A cable
	Jitter tolerance	> 0.7UI (Alignment)
BNC Output	Impedance	75Ohm
	Output voltage	0.8Vpp (typ.)
	Return loss	> 15dB, 5 ... 1485MHz > 10dB, 1485 ... 2970MHz
	Output jitter	< 0.2UI (Alignment), < 0.5UI (Timing)
Video Latency	Input to Output	120 ... 200pixel, depends on video standard
Audio Latency	Input to Output	Embedder and de-embedder combined HD, 3G < 0.6ms SD typ. 1.5ms (< 2ms)

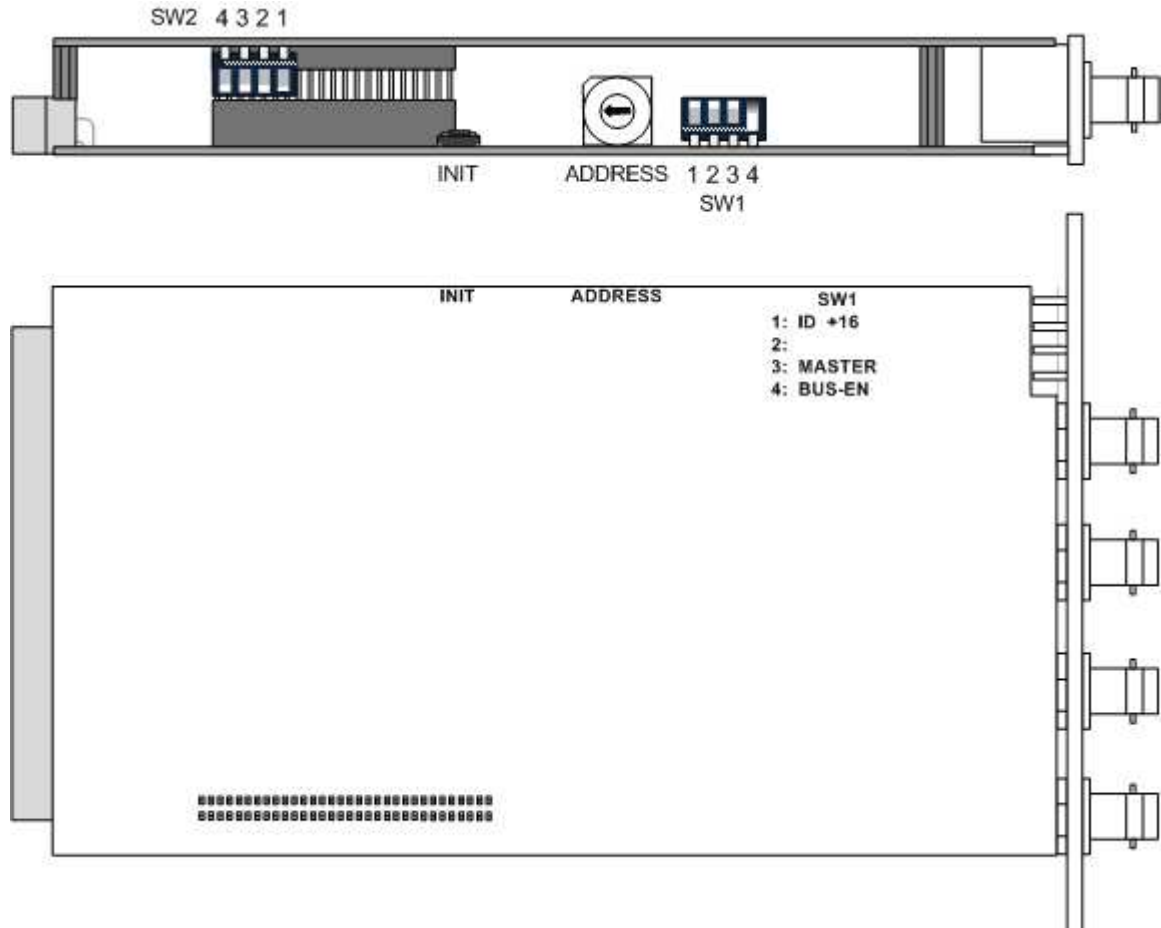
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Power Supply	5Vdc (4.75 ... 5.25V), max. 1100mA
Dimension	3RU, 4HP, 160mm depth (DIN41612 backplane connector)
Environmental	Operating temperature 0 ... 40°C, Non-operating -20 ... 70°C, Humidity < 90%, non-condensing
General Features	<ul style="list-style-type: none">• Power fail relay bypass (may be activated via GUI)• Lip-Sync compensation for processed and non-processed audio signals• Dedicated routing for non-processed channels, all channels (max. 16) can be routed to/from the device or looped through• Test pattern generator• Master-sync capable• ITU-R BT.1685 / ARIB STD-B39 metadata support

Important Note! Do not place the **C8405** close to either the power supplies or the side panel of the c8k frame. Due to the high density of hot components on the PCB you may otherwise overheat the module.

location of switches:



initial set up / bus assignment

For the initial setup the **CAN address** selection is the most important setting. To avoid address conflict with other C8k modules the CAN address setting must be done with care. See C8k System manual for details.

The **MASTER MODE** is important if the **C8405** must deliver the audio clock for signal distribution within the C8k frame.

The **BUS-EN** switch controls the driver circuits when power is turned on. This allows you to insert a new module into an existing system without the risk of disturbing signals on other busses if the drivers are disabled when the module is inserted into a frame with unknown bus configuration.

switch settings

INIT

Pressing the **INIT** button during power up will initialize the module parameters to factory default values.

ADDRESS

Set the **CAN ADDR** rotary encoder to an address, which is not in use by another module of a C8000 frame (for details regarding CAN addressing, see C8000 system manual).

SW1

1 = ID +16

ON

CAN address is extended by **+16** (counting from 0x10 to 0x1F)

OFF

CAN address is standard (counting from 0x0 to 0xF)

2 = Not Used

OFF

3 = MASTER:

ON

The C8405 is clock master for the C8000 system

Important note! In **Master Mode** the **C8405** must be inserted into one of the red color coded slots of the C8k frame. Any other sync module must be removed from the frame in such a case!
For the **C8934** Split-Frame there is no special slot.

OFF

Standard operation, no special care is needed

4 = BUS-EN:

ON

Connects the outputs to the C8k audio buses on power up

OFF

Disconnects the module outputs from the C8k buses on power up

Important note! To avoid audio bus conflicts when you replace a **C8405** or install an additional one and the configuration is unknown, the output bus drivers must be disabled before inserting it. If all settings are done remotely and the unit fits into the bus assignment scheme of a frame, you must remove it and place the switch back into position **BUS-EN=ON**.

SW2

1 = Not Used

OFF

2 = Not Used

OFF

3 = Not Used

OFF

**4 = HD progressive
switching mode**

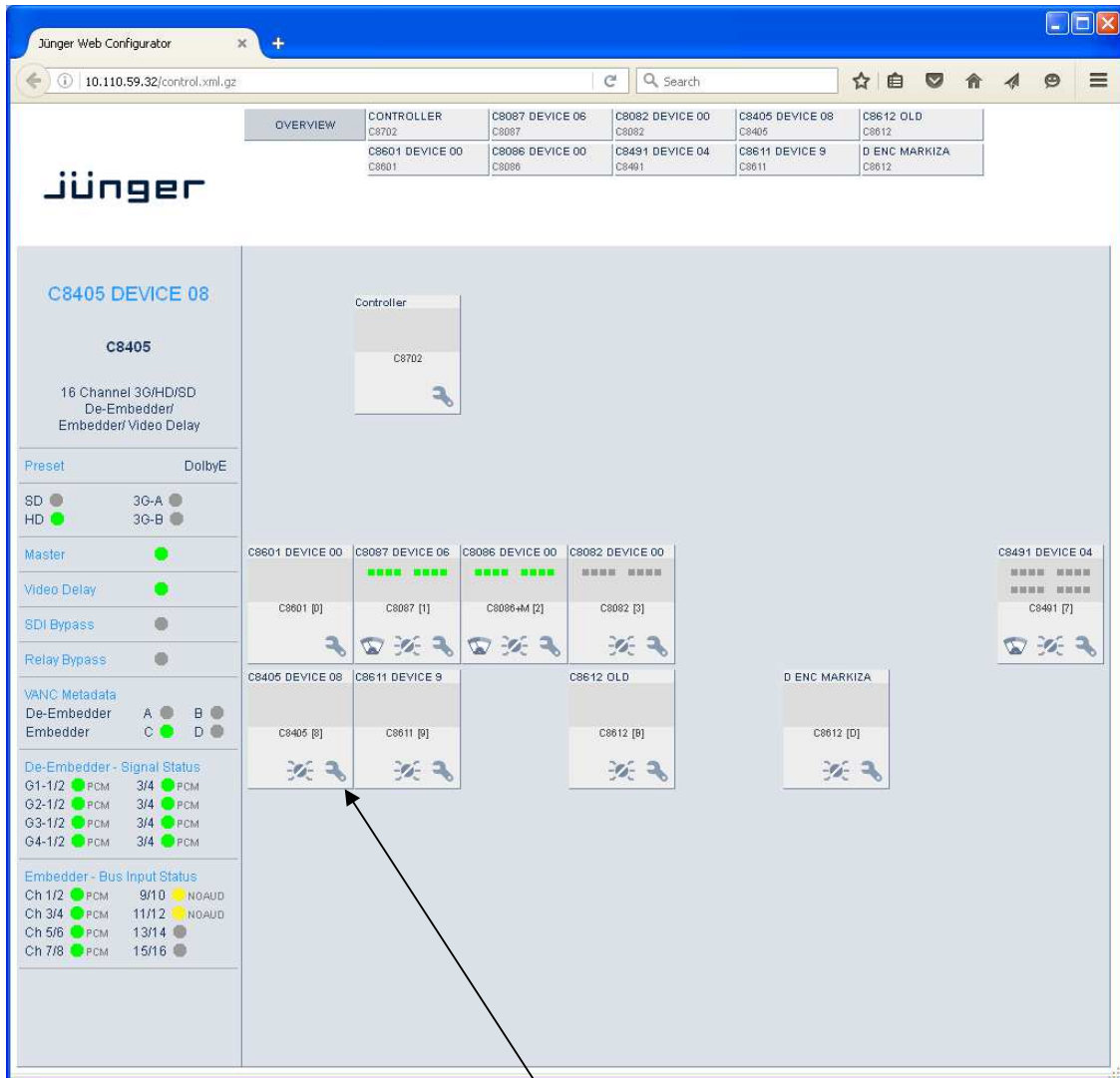
ON

For progressive HD formats carrying Dolby E signals, it is mandatory to switch only every second HD frame, because a Dolby E data frame [40ms] spans over two progressive video frames. Otherwise one may cut the Dolby E data frame present at the switching moment in the middle resulting in audio noise after decoding. Dolby recommends using a synchronous BB as a reference for the switching point. In this case the system must be synchronized by a C8840 and the C8405 **must not** be set to master mode! In addition to that, **SW2-4** must be turned **ON** to use the V-sync derived from the BB to act as the switching point reference for the internal matrix as well, instead of the SDI frame reference itself.

web browser based GUI

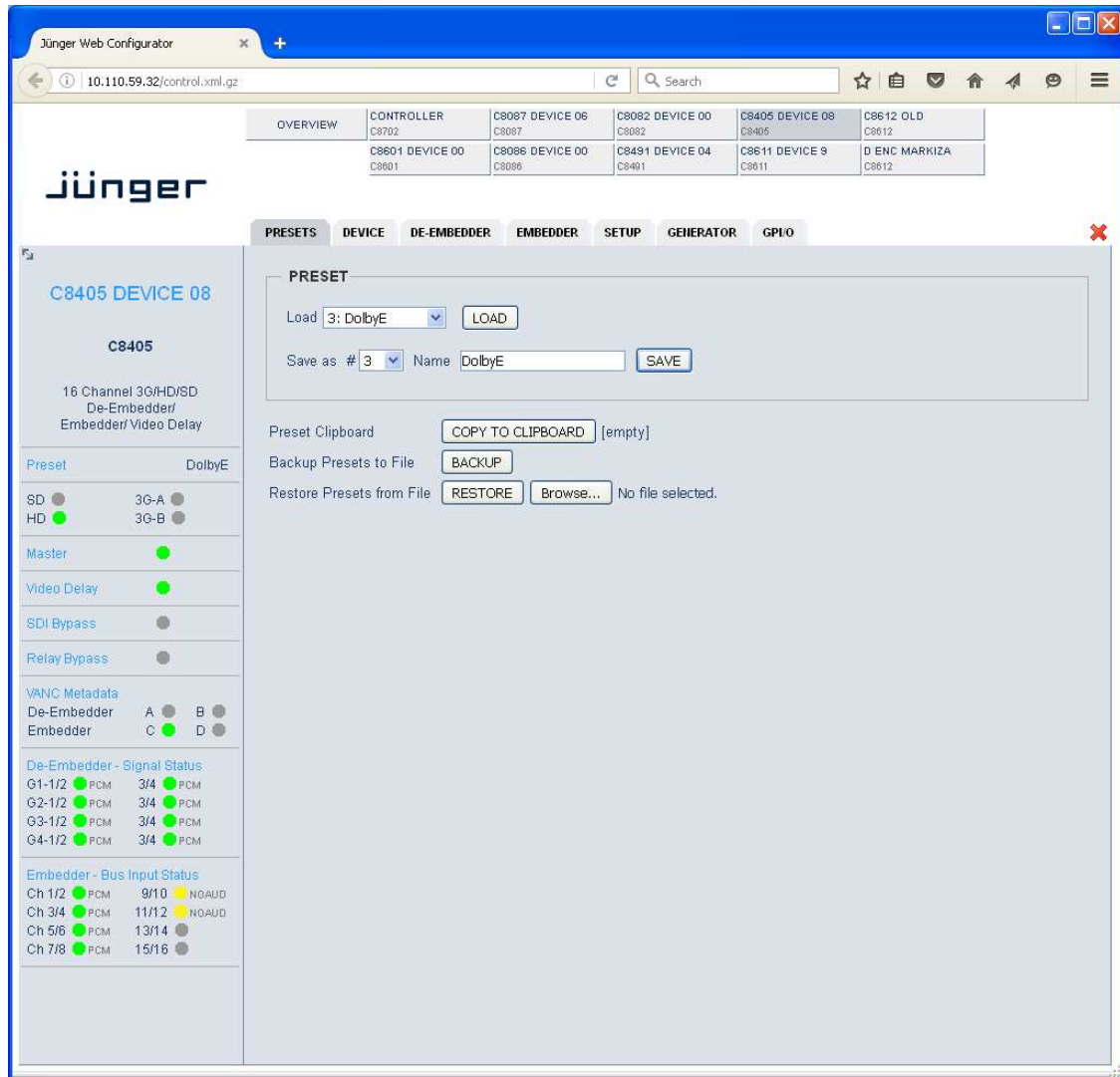
OVERVIEW

The modules overview of a frame (below the display of an example frame) :



By simply clicking on the spanner tool symbol ● you will get the control pages of the **C8405** and the status window on the left side, which you will also see on mouse over. The entrance to the module setup is the **PRESET** page:

PRESETS



The **C8405** has **16 Presets**. These Presets are named **PRESET 01** to **PRESET 16** by default. The status window at the left hand side shows the name of the active preset. The word “**modified:**” will appear in line with the Preset name, if a preset parameter was changed by the operator.

Load Preset

Select a preset by name and press **<LOAD NOW>**.

Save as Preset #

Select a preset memory number.

Name

Assign the preset a **16 digit name** and press **<SAVE NOW>**.

Preset Clipboard

Copy the active preset to a clip board, The data may be used by other modules inside the same frame.

Backup Presets to File

Creates a backup **XML file** which may be stored to the PC.

Restore Presets from File

You can select a **backup file** from the PC.

DEVICE



On the **DEVICE** page you can assign a **16 digit name** to the module, perform a warm start by pressing **<RESTART>** or initialize the module to factory default settings by pressing **<INITIALIZE>**.

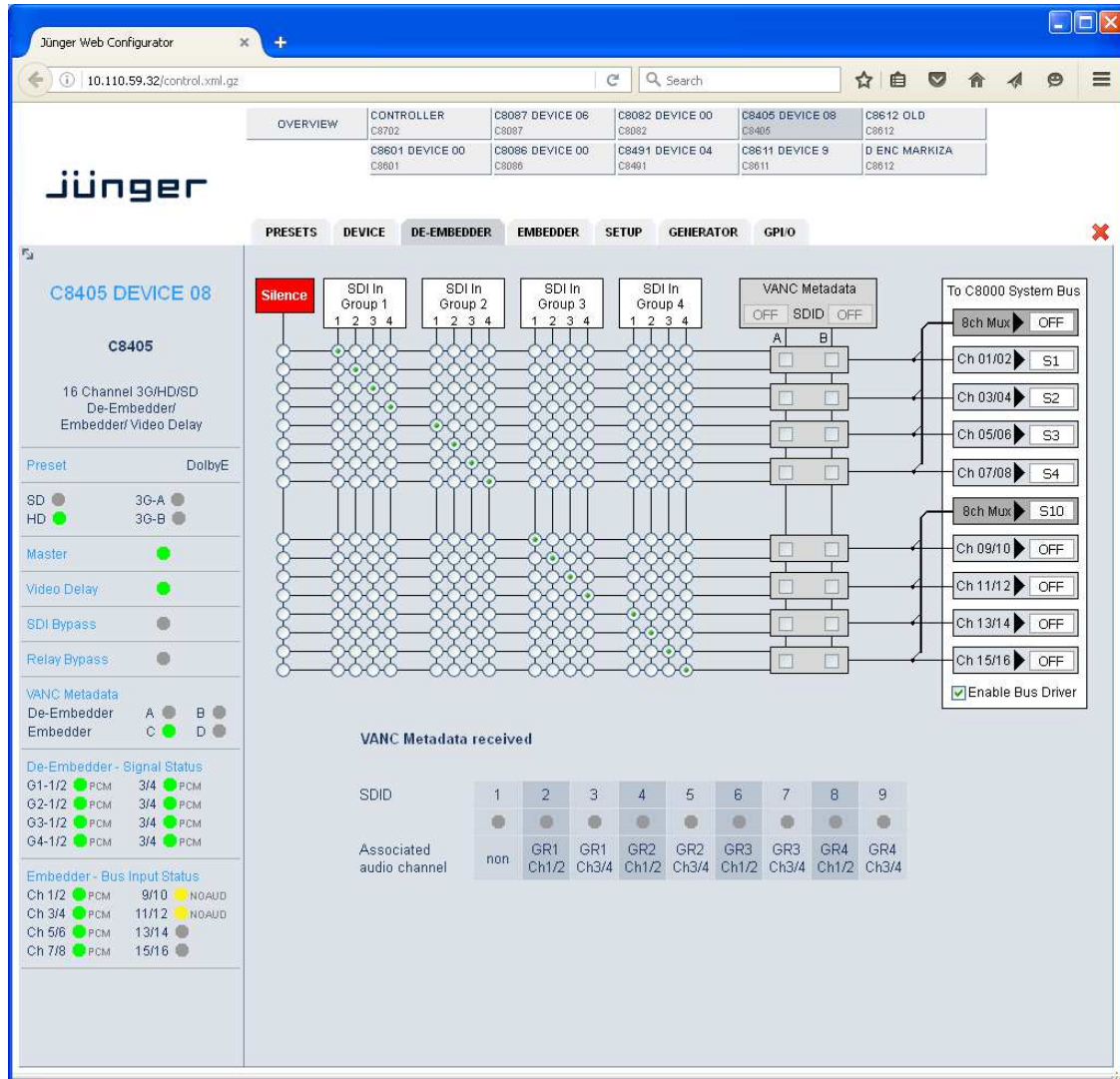
You can **BACKUP / RESTORE** all module settings and parameters including presets as well as the actual set of parameters used by the module controller.

FIRMWARE

Controller
SDI
FPGA

The firmware of the module controller
The firmware of the SDI part
The version of the FPGA on the audio board

DE-EMBEDDER



On the **DE-EMBEDDER** page you will get a matrix overview of the signals which are extracted from the SDI data stream and sent to the C8k audio frame bus. The de-embedder can route all of the 16 embedded audio channels in any combination to the C8k audio busses.

In addition to the 16 signals from the 4 groups, a **Silence** source is provided.

8 channels may be grouped and sent in **8CH Multiplex Mode** over **one** bus line.

You can enable / disable the Bus Drivers to set up the module without interference with other modules already installed.

VANC Metadata

The **C8405** may receive, decode and insert **VANC Dolby Metadata** into the c8k Metadata distribution system for use by other modules inside a frame.

The transport of Dolby Metadata embedded into the Vertical Ancilliary data space of an SDI signal is defined by **SMPTE 2020** suite of standards. For details pls refer to such documents.

In general the mechanism may provide up to eight independent Dolby Metadata Streams. The format of the streams is asynchronous data like one will find on the Dolby 9-pin serial Metadata Interface of the Dolby decoders and encoders as well as the C8601 Dolby E/D decoder, the C8611 Dolby E encoder and the C8612 Dolby D/D+ encoder from Junger Audio.

The streams are identified by a DID Data Identifier (value 0x45). Each individual stream is identified by its Secondary Data Identifier SDID. The SDIDs range from 1 to 9.

SDID 2 – 9 are used to identify the streams associated with a respective program. The SDID number also tells which embedded audio signal pair (e.g. G1-1/2) carries the first pair of audio channels for that program. The rule is that further audio channels belonging to the same program must be embedded in consecutive order.

SDID 0x01 identifies a Dolby Metadata stream that is not associated with an audio channel pair and may be used if only one VANC stream is embedded.

The Junger Audio system allows to de-embed up to two independent VANC Dolby Metadata streams named **A** and **B**. You can select the respective SDID for the de-embedder.

The table at the bottom of the DE-EMBEDDER page shows the VANC streams found in an embedded signal :

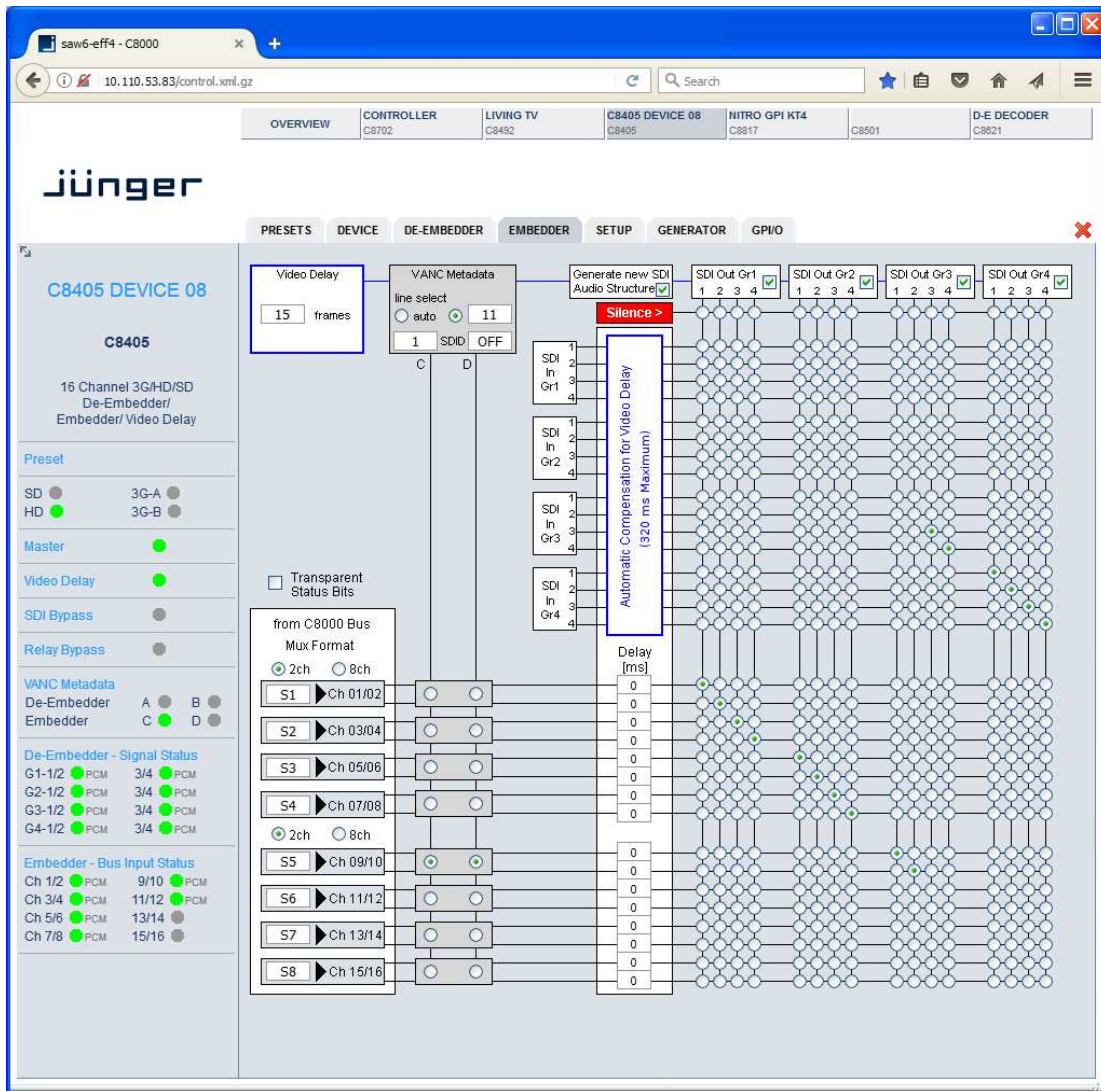
VANC Metadata received									
SDID	1	2	3	4	5	6	7	8	9
	●	●	●	●	●	●	●	●	●
Associated audio channel	non	GR1 Ch1/2	GR1 Ch3/4	GR2 Ch1/2	GR2 Ch3/4	GR3 Ch1/2	GR3 Ch3/4	GR4 Ch1/2	GR4 Ch3/4

Via the VANC de-embedder routing you may link the respective Metadata to their audio channels. The Junger Audio Metadata system inside the c8k frame makes use of the ASE User Bits to move Metadata to other modules. If you disable the VANC routing these User Bits are transparent again and carry the information from their source somewhere upstream.

The status panel at the left hand side in the GUI shows if the pre selected stream carries valid Metadata (green) or not (red) :

VANC Metadata				
De-Embedder	A	●	B	●
Embedder	C	●	D	●

EMBEDDER



The **EMBEDDER** page is a little more complex because it allows routing within the SDI domain as well as in any combination with signals returned from the audio busses.

A word on embedding

*There are two principle methods to embed audio. First of all you can leave the **Ancillary Audio Data** structure as it is and simply replace the audio samples. If there is no Group existing from the input you must build a new one and place it somewhere in the Ancillary Data area. Unfortunately **SMPT E** left room for freedom where to place the data. This may cause fragmented data blocks after the embedding process, with wrong parts left over. If this is the case a downstream de-embedder will be confused and may reassemble the audio samples in a wrong way causing distortion. That's why the C8405 offers a mode where you can clean up the incoming data structure and generate a new one.*

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Video Delay

For compensation of any kind of audio processing delay within the chain of devices you may use a Video Delay. Position "0" turns the delay function off.

Important note! The video delay is a static setting. I.e. you **must not** change it on air! This will cause a resynchronization of the SDI stream. Since the video delay is part of the presets, you must be careful when creating presets to use the same value in all presets!

Generate new SDI Audio Structure

If there is the need to replace the structure of the **Ancillary Audio Data Blocks** you can clean the whole area and generate a new structure. If the option is checked, there will be no signal available at the group output as long as there is no **SDI Out Grx** checked.

SDI Out Grx

This check box enables each of the 4 SDI audio groups to be used individually by the C8405 embedder. If it is not checked and "**Generate new SDI Audio Structure**" is not enabled, the audio data from the input will travel untouched from the SDI input to the output.

Silence

Mutes the respective audio channel at the embedder side.

Delay

The inputs of the embedder routing matrix can be taken either from the de-embedder or from the C8k audio busses in any combination. If they are taken from the de-embedder and a **Video Delay** is introduced, the Video Delay will **automatically** be **compensated** for those signals.

For signals coming from the C8k audio busses an **independent delay** per single channel to the embedder is available.

Important note! These delay settings are also static. You **must not** use this feature if you shuffle audio signals with different delay times. It will cause strange effects at the moment of switching, because the delay length is changing!

Mux Format

The signals from the C8k audio busses may be received in **2CH or 8CH multiplex mode**. If they must be received in **8CH** multiplex mode there is only one bus selector available for each of the two eight channel groups.

Transparent Status Bits

For the signals coming from the C8k audio busses, you can decide whether the **AES Channel Status Bits** are taken from their source (transparent) or if you want to generate new ones.

In this case the **Channel Status** will be set to:

Format :	Professional
Audio Mode :	Audio
Emphasis :	None
Freq. Mode :	Locked
Sample Freq. :	48kHz
Channel Mode :	Not Indicated
User Bits :	None
Auxiliary Bits :	24Bit
Audio Word Length :	Not indicated

VANC Metadata

The **VAC Dolby Metadata** embedder allows you to embed two independent Metadata streams **C** and **D**. You may assign each stream an independent SDID (see page 9 for details). The Metadata to be embedded are extracted from the User Bits of the audio data received by the respective c8k audio busses.

You can select a line where the Metadata must be embedded or you can leave it in "**auto**" mode. In this case the next possible line that has nothing embedded will be selected.

SETUP



From here you can set up several hardware related functions :

SDI Bypass

will pass the embedded audio data from the de-embedder to the embedder 1:1. This function preserves the original Ancillary Data structure.

Relay Bypass

will deactivate the **Bypass Relay**. It provides a short cut from **SDI-IN** to **SDI-OUT1** and disconnects the de-embedder from the SDI input. This relay also serves as a **fail bypass** if the power is off. This feature maintains the SDI signal for downstream equipment.

SNMP: Input lost

The monitoring function of the physical SDI can be disabled for the SNMP agent, to prevent from unwanted traps if the module is frequently taken out of service. The SDI status display within the GUI is not affected.

Relay Wait Time After Power Up	The time from powering the C8405 up till the relay is engaged. To avoid audio interruptions you should not engage the relay before you are sure that all other equipment in the signal chain is up and running. Because this is an asynchronous process the relay switch over causes a glitch in the SDI signal.
Error Detection	<p>The serial audio data from the frame bus can be monitored for proper positioning of an Error-Flag. A bad Error-Flag is an indication that there is disturbance upstream (input signal, input module, DSP module).</p> <p>The Error Detection can be turned Off and On for each input from the bus. You will see the status on the left hand side: "Embedder (Bus Status)". A grey "LED" shows that the detection is disabled. While green is OK, red indicates an error condition and yellow indicates a Non Audio signal (e.g. Dolby E stream).</p> <p>The bus status as well as the SDI input status may be presented to external monitoring systems via SNMP. The frame controller summarizes such status information and generates SNMP traps for the frame as an entity or may activate GPOs (if GPI/O module(s) are installed). The SNMP manager may afterwards poll the "modulesStatus" for more detailed status information per input (see SNMP documentation for details).</p>
Main Input	This is a display of the audio busses which have been assigned at the EMBEDDER page.
Alternative Input	For automatic bypass of a (e.g. faulty) processing module or switching over to an emergency announcement you may set up alternative inputs. Switch over may be tested with the TEST button.
Auto Mode	Enables the automatic switch over in case an error is detected for the Main Input.
Important Note!	Auto Mode is possible only if Error Detection is turned on.
<TEST>	The soft button may be used for testing the switch over function.

GENERATOR



Generator enabled

The video generator may be enabled here. The **video format** it generates depends on the selection below.

Test Pattern

If the Generator is on, it will generate one of the two video test patterns either black or 100% color bar.

Video Format

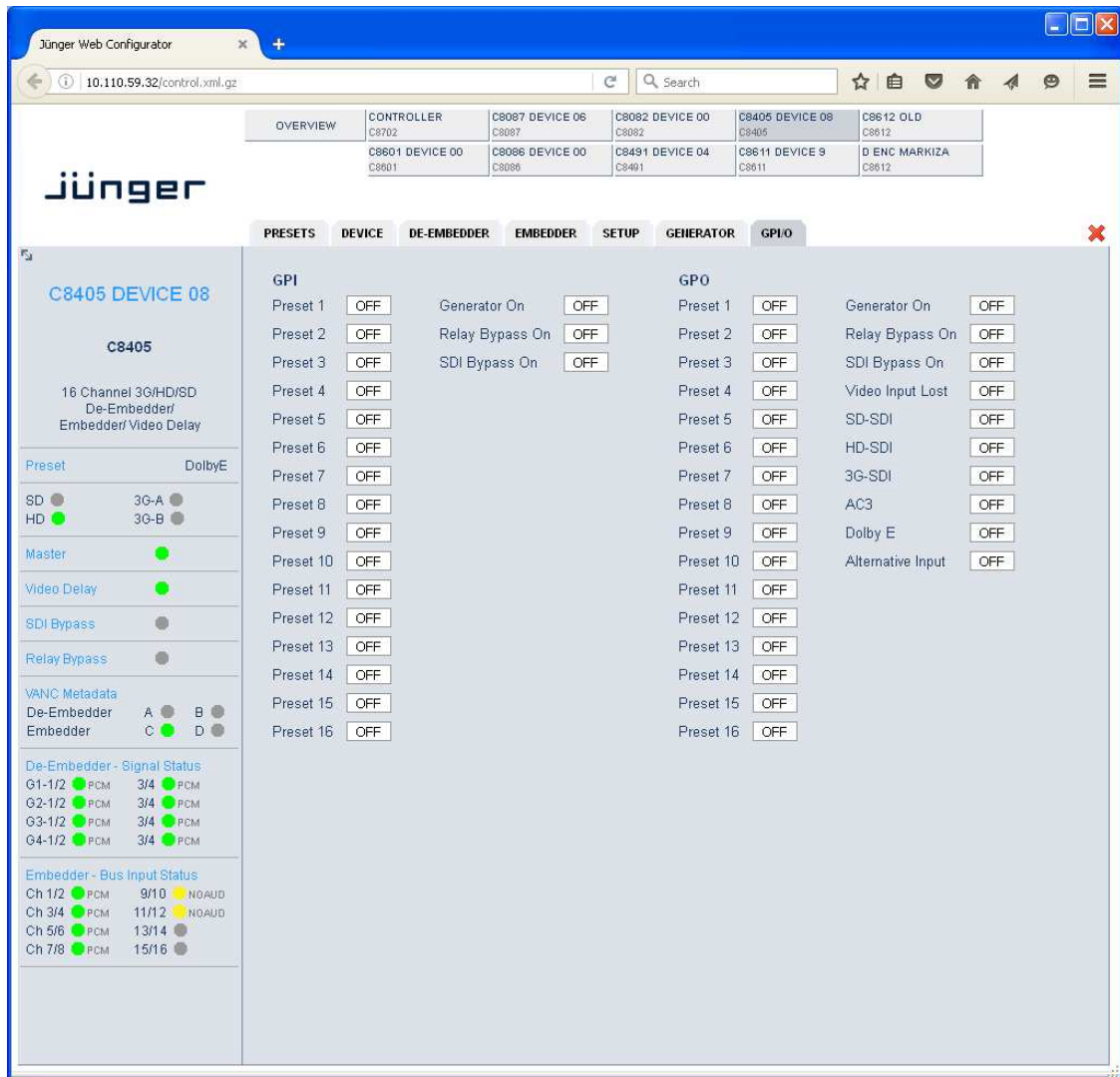
If the **Automatic** mode is selected and the Generator is enabled, it turns on if the SDI input signal fails. In this case it will generate the same video format as the previous input signal.

If **“Generator enabled”** is checked and if you have selected one of the **Video Formats** the Generator will be turned on using this format.

Important note! If the **generator is on**, either in manual or in automatic mode, it operates on an internal quartz reference. It is **not possible** to **genlock** it to an external reference.

The **SDI input will be ignored** but you may embed signals from the C8k audio busses for testing purpose or you can use the SDI stream as a carrier to send 16 audio channels from A to B over one coax cable.

GPI/O



GPIs are useful if you want to recall settings remotely e.g. by presets.

The C8k frame can handle **127** different **GPIs**. You must assign a unique number to the respective function. Such numbers will be generated by the **brc8x** Broadcast Remote Controller or by a **GPI/O interface module GPO** (see C8817 manual for details). If the **C8405** receives such a number it will for example load the respective preset or will turn the generator on.

GPOs (Tallies) may signal the status of a module. The **GPI/O module** permanently listens for such numbers. If it reads such a number it will engage the respective **GPO** (see C8817 manual for details). This allows for easy interconnection with more generic monitoring equipment.