AV-3G-XMUX

Digital audio embedder/ de-embedder

User manual

Rev. 1

Nevion Support

Nevion Europe

P.O. Box 1020
3204 Sandefjord, Norway
Support phone 1: +47 33 48 99 97
Support phone 2: +47 90 60 99 99

Nevion USA

1600 Emerson Avenue
Oxnard, CA 93033, USA
Toll free North America: (866) 515-0811
Outside North America: +1 (805) 247-8560

E-mail: support@nevion.com
See http://www.nevion.com/support/ for service hours for customer support globally.

Revision history

Current revision of this document is the uppermost in the table below.

Rev.	Repl.	Date	Sign	Change description
1	0	2011-10-20	AJM	Changed optical overload.
0	-	2011-08-25	MDH	Initial revision

Contents

1 Product overview 4
1.1 Extra 3G functions 5
1.2 Signal flow 5
1.3 Data signal 6
2 Specifications 7
2.1 Measurement conditions 7
2.2 General 7
2.3 Processing 7
2.4 Inputs 8
2.5 Outputs 9
3 Configuration 10
3.1 DIP switch routing 10
3.2 Other DIP Switches 12
3.3 DIP configuration examples 14
3.4 GYDA Control 15
3.5 Data transmission 17
4 Connections 19
4.1 Summary 19
4.2 Audio connections DB25 20
4.3 Data/GPI connections 20
5 Operation 21
5.1 Front panel LEDs 21
5.2 GPI alarms 22
General environmental requirements for Nevion equipment 23
Product Warranty 24
Materials declaration and recycling information 25
A.1 Materials declaration 25
A.2 Recycling information 25
EC Declaration of Conformity 26

1 Product overview

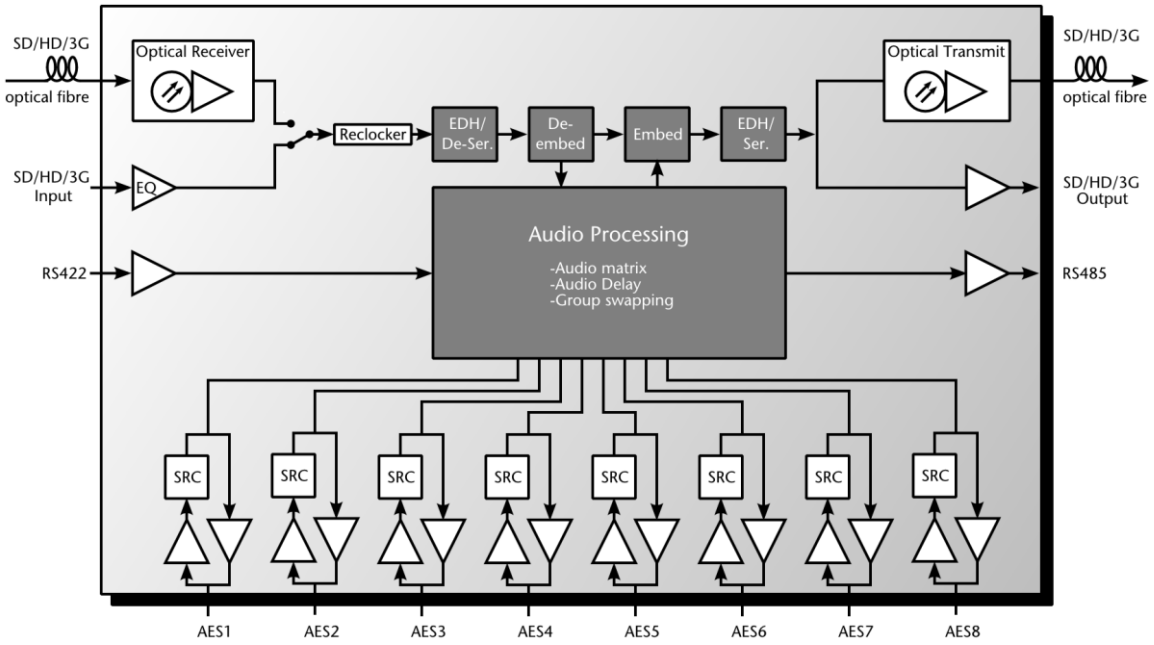


Figure 1: Module overview

The AV-3G-XMUX is a highly integrated audio embedding module in the Flashlink range, offering simultaneous embedding and de-embedding of eight AES3 stereo digital audio channels from a digital 3G, HD or SD serial video signal. The modules can:-

- AV-3G-XMUX can handle SD, HD and 3D digital uncompressed video.
- De-embed and embed all groups of audio.
- Copy or move audio groups without additional delay.
- De-embed 8 AES3 digital audio and non-audio signals.
- Embed 8 AES3 digital audio and non-audio signals.
- Apply sample rate converters on the AES inputs when needed.
- Make mono mixes of four signals.
- Have optical laser output, including DWDM.
- Have optical input, including APD.
- Transport asynchronous serial data.
- Generate video and audio signals including on screen label generator.
- De-glitch correctly synchronized switched video.

The module has two main processing blocks. One processes the video stream and the packet data, the other processes the audio. The packet processing core forms a group router which can route embedded audio between groups without any extra delay.

The AV-3G-XMUX audio core is an AES3 audio router. The received embedded audio and the AES3 inputs are the sources in the router. The embedded output groups and AES3 outputs are the destinations. This feature may be used to perform stereo channel swapping.

An eight output mono mixer is integrated into the stereo router. Each mono output is the sum of four signals via faders. A delay line is also available on each of the mixer outputs with a delay of 2.5s. The sources to the mixer are the same sources as in the stereo router. The outputs from the mixer provide four extra stereo sources in the audio router.

There are 8 AES ports and each may be used as either an input or an output. The sample rate converters may be inserted by the module when needed, or the user can disable them. Data signals such as Dolby E will always be embedded transparently without using the sample rate converters.

All embedding and de-embedding is with synchronous 48 kHz audio.

The unit may be ordered with optical transmitter and receiver options. The laser options range from the standard -7.5dBm 1310nm to the DWDM units. The receivers may be either PIN or APD for extra high optical budget.

The module has signal generators for audio and video for test and line-up applications. The internal video generator may be used as a fall-back source that is used if the both the electrical and the optical input signals fail. This allows uninterrupted transmission of embedded audio.

1.1 Extra 3G functions

The module has two different user interfaces in the Gyda System Controller. The ‘Large’ mode is used if the additional audio in the 3G video signals are used. The ‘small’ mode represents the module in a similar way to the other Nevion XMUX embedders and only shows the traditional audio groups 1 to 4. The other 3G audio groups are still transported through the module.

The module can embed 4 audio groups: Either the conventional 4 groups or the four additional groups in 3G video. All 8 audio groups are de-embedded from 3G video both in layer A and layer B. This functionality should be enabled if the user needs access to the audio in groups 5 to 8 in layer A video OR audio in the second link of Layer B video. The four audio groups that are not embedded by the module will be transported without any delay. This means that the use of the module with a mixed video format line will be predictable.

If the module is to be used to embed the extra 3G audio signals then it will transport the normal 4 audio groups transparently. If SD or HD video is then fed to the same embedder, the embedders will be disabled. De-embedding from the normal groups will be performed as before.

1.2 Signal flow

Video may be presented on the optical or electrical inputs. The module will switch to the other input if the module can not lock to a signal. The video is re-clocked and transformed to parallel video. The parallel video goes into a line buffer which is used to de-glitch the video when switched on the correct line. No errors are flagged or produced when the video is switched on the appropriate switching line. All ancillary data, including embedded audio is extracted from the video signal. All the packed data is sent to the group router. The de-embedded audio is sent to the stereo audio cross-point router.

The AES audio inputs are initially connected directly to the audio router. Sample rate converters are inserted if there are sample slips *and* the signal is not a data signal. The use of the sample rate converters may be disabled. See chapter 3.

Four of the router sources are from the audio mixer. Each mixer mono output is the sum of four mono inputs. Each input may be any of the router source signals. Each of the four input signals has a level fader. Each of the eight mono outputs may be delayed by up to 2.5s.

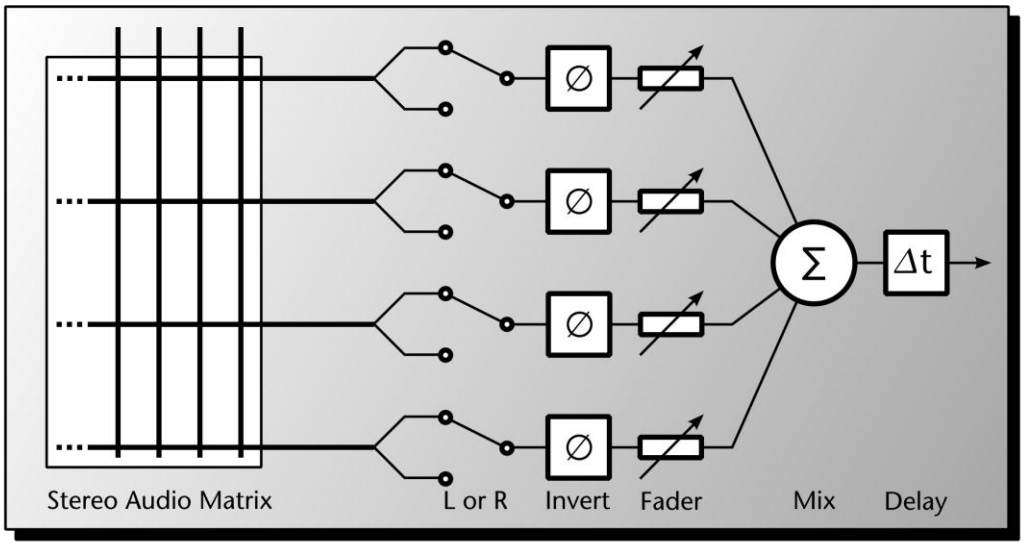


Figure 2: Mixer channel, block diagram

The audio signal is delayed by a few samples during de-embedding, re-packeting the audio and audio processing. Signals that pass through the stereo audio router will be delayed by a small number of samples. The group router outputs from the de-embedders do not introduce any additional delay as the audio does not require unpacking and re-packing.

The embedder core embeds either re-packeted audio from the stereo router or the existing de-embedded audio as configured in the group router.

The embedded audio packets are inserted into the video signal together with the control packets and any other packets that were present in the original video signal. The video is serialized and output through the cable and laser drivers. The AES audio output signals are taken from outputs of the audio router.

1.3 Data signal

Data signals are transported using the user (U) bits in AES audio streams. The de-embedding and embedding is performed in the AES audio router core. *Any* input in the router core may be chosen for data de-embedding and any router output may be used to embed data. See section 3.5.

1.3.1 De-embedding

The module receives many AES signals and data may be present on any of them. The user must configure which AES signal the data is expected to be on. The status page in GYDA will show the presence and the type of data detected on the configured channel. De-embedded data is output on the RS485 backplane output.

1.3.2 Embedding

Two things must be configured for embedding data.

1. The data format to be received on the backplane connector.
2. The audio signal(s) to embed data into. The channel status (C) bits of the channels are also overwritten.

2 Specifications

2.1 Measurement conditions

Audio Sampling rate	48 kHz
Ambient temperature	25ºC

2.2 General

Power:	+5V 4.3W
Control:	DIP switches or GYDA system controller.
Monitoring:	Front panel LEDs, GYDA system controller and GPI.
EDH/CRC processing:	Full. Received flags are updated, new CRCs are calculated.
Boot time:	1 second
Audio inputs and outputs:	Conform to AES3-2003
Electrical Video inputs and outputs:	Conform to SMPTE 424M-2006
Optical video inputs and outputs:	Conform to SMPTE 297M-2006
Data input and output:	Conform to EIA RS-485

2.3 Processing

Video latency is variable due to the de-glitcher but the values below apply when the video signal is first applied.

Other latency values are maximum values.

2.3.1 SD latencies

Video:	des+4+350+256+2+ser video samples = 45.3us
Audio embedding:	AES+2+1+16 audio samples=20/48000 = 417us
Audio de-embedding:	4+16+1 audio samples =21/48000 = 438us
Embedding GPI mode:	8+4+32 96kHz samples =44/96000 = 458us
Embedding UART mode:	32+128+17+16 96kHz samples =193/96000 = 2.01ms
De-embedding GPI mode:	8+32+8 96kHz samples =44/96000 = 458us
De-embedding UART mode:	8+32+8 96kHz samples =48/96000 = 458us

2.3.2 HD latencies

Video:	des+8+1024+1024+3+ser video samples = 27.6us
Audio embedding:	AES+2+1+8=12 /48000 = 250us
Audio de-embedding:	2+8+1=11/48000 = 229us
Embedding GPI mode:	8+4+16 96kHz samples =28/96000 = 292us
Embedding UART mode:	16+128+17+16 96kHz samples =177/96000 = 1.84ms
De-embedding GPI mode:	4+16+8 96kHz samples =28/96000 = 292us
De-embedding UART mode:	4+16+8 96kHz samples =28/96000 = 292us

2.4 Inputs

2.4.1 Electrical video input

Video Data rates:	SD, HD and 3G.
Video frame rates:	24p, 50i, 60i, 50p or 60p and pull down rates
Video standards not supported:	1250 line SMPTE 295M
Connector:	BNC

2.4.2 Optical video input-PIN

Optical wavelength:	1200-1620nm ±40 nm
Maximum Optical power:	SD/HD: -3 dBm, 3G: -5 dBm
Sensitivity SD/ HD /3G:	-25/ -20/ -17 dBm
Return loss:	Better than 27 dB.
Maximum reflected power:	4%
Transmission circuit fiber:	Single mode
Connector:	SC/UPC

2.4.3 Optical video input-APD

Optical wavelength:	1200-1620nm ±40 nm
Maximum Optical power:	-9 dBm
Sensitivity SD/ HD /3G:	-33/ -30/ -28 dBm
Return loss:	Better than 27 dB.
Maximum reflected power:	4%
Transmission circuit fiber:	Single mode
Connector:	SC/UPC

2.4.4 Audio Inputs

Number of AES3 inputs:	Up to 8
Audio data rate:	30 kHz to 100 kHz, converted to 48 kHz if not isochronous to the video input signal.
Impedance (C1 backplanes):	110 ohm transformer balanced.
Connector (C1 backplanes):	25 pin D-sub.
Impedance (C2 & C3backplanes):	75 ohm unbalanced.
Connector (C2 & C3backplanes):	BNC
Embedded audio word length:	24 bits
Embedded audio Channel status:	As received when isochronous, otherwise fixed.
Sample rate converter dynamic range:	139 dB(A) @ 1 kHz

2.4.5 Data inputs

RS422	1
Connector	8P8C Modular jack (RJ45)
Packet mode:	
Baud rates	9600 to 115200
Data length	7 or 8 bits
Parity	None, odd or even
Stop bits	1, 1.5 or 2 bits
GPI mode:	
Raw data sampling frequency:	93750 Hz

2.5 Outputs

2.5.1 Electrical video output

Number of HD/SDI outputs:	1
Connector:	BNC

2.5.2 Optical video output

Transmission circuit fiber:	9/125um Single Mode
Connector:	SC/UPC
13T Optical wavelength	1310nm ±40nm
Light source:	FP semiconductor laser
Optical power:	-5 dBm
Extinction ratio:	>5:1
13T0, 15T, CxxxxT Optical wavelengths	1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610nm ±6nm
Light source:	DFB semiconductor laser
Optical power:	0 dBm
Extinction ratio:	>8:1
Dxxxx Optical wavelengths	ITU G694.1 100GHz raster
Light source:	DFB semiconductor laser
Optical power:	0 or +3 dBm
Extinction ratio:	>10:1

2.5.3 Audio outputs

Number of AES3 outputs:	Up to 8
Audio data rate:	48 kHz
Impedance (C1 backplanes):	110 ohm transformer balanced.
Connector (C1 backplanes):	25 pin D-sub.
Impedance (C2 & C3backplanes):	75 ohm unbalanced.
Connector (C2 & C3backplanes):	BNC

2.5.4 Data outputs

Number of RS485 outputs	1
Connector	8P8C Modular jack (RJ45)

2.5.5 GPI outputs

Signals:	Status good, no video input lock, laser failure.
Connector:	8P8C Modular jack (RJ45)
Signal type:	Open drain transistor with free-wheel diode.
Maximum voltage:	100 V
Maximum current:	150 mA

3 Configuration

The XMUX embedding core has five main configuration elements.

1. Operating mode.
2. 8 AES ports which may be used as outputs or inputs.
3. 30x16 stereo audio router.
4. 4x4 group router.
5. 8 channel mono audio mixer. (Future firmware)

The AV-3G-XMUX has two main operating modes.

- Small: Traditional 4 audio group embedder. Embedding and de-embedding of audio groups 1 to 4. Extra 3G audio groups in a signal will still be transported.
- Large: Access and configuration of extra 3G audio groups. De-embedding of all 8 groups. Embed to *either* groups 1 to 4 OR groups 5 to 8. The non-embedded groups are always transported.

The inputs or sources in the stereo router are from the de-embedded audio groups, the AES inputs, the mixer outputs and the two built in generators.

The stereo router outputs or destinations are the groups of embedded audio in the output video and the AES outputs.

The group router is used to transport or shuffle groups without introducing any additional delay.

A normal de-embedder configuration would route the de-embedded audio to the AES outputs.

A normal embedder configuration would be to route the AES inputs to the appropriate embedder group outputs.

The AV-3G-XMUX module can do both at the same time!

Many other configurations are possible and the module may be dynamically controlled as a 32x16 audio router via the system controller, GYDA.

Full control of the module is performed with the GYDA system controller. Controls only possible with GYDA are:

- The data transmission parameters and channel selection.
- The delay lines delays and routing to and from the mixer.
- Video and audio generator configuration.
- Audio mixer configuration.

3.1 DIP switch routing

Full hardware control of all of the parameters in the module would require either, a complicated menu type of control interface with a display and control buttons; or an enormous number of switches. In many cases, most of the parameters will not be changed from the default settings. It was decided to control only the most used parameters with switches covering the most used configurations. This still requires the use of 24 switches.

The switches are only read during the power-up process.

There are not enough switches on the module to allow full stereo routing configurations. Groups of four channels are routed together as units, for example: AES channels 1&2, embedded audio group 1.

The routing is controlled with the two first DIP switch blocks SW1 and SW2 which are at the top of the module, closest to the handle. Each routing set is controlled with four switches, 1 switch controlling the direction/destination, and 3 switches for the routing.

The other configuration options are set in the third DIP switch block.

3.1.1 AES direction/destination selection

The 1st switch in each set of 4 controls two things:

1. The direction for 2 AES ports
2. The routing destination for the 3 switches.

Up or on means:

- The AES ports are inputs.
- The routing selects the source for an embedder group.

Down or off means:

- That the AES ports are outputs.
- The routing selects the source for AES outputs.

For Example: When SW1 switch 1 is ON:

- The module will embed into group 1 and AES 1&2 are inputs.
- The next three switches 2, 3 and 4 control which source will be embedded into group 1.

If SW1 switch 1 is OFF:

- The module will NOT embed group 1 and AES 1&2 are outputs.
- The next three switches 2, 3 and 4 control which source will be routed to AES outputs 1&2.

This pattern applies to all the switches of SW1 and SW2.

SW1			
1	**2-4 route to**	**5**	**6-8 route to**
ON	Emb Group 1	ON	Emb Group 2
OFF	AES 1&2	OFF	AES 3&4

SW2			
1	**2-4 route to**	**5**	**6-8 route to**
ON	Emb Group 3	ON	Emb Group 4
OFF	AES 5&6	OFF	AES 7&8

Table 1: DIP blocks 1 & 2

This system reduces the number of switches needed to set up the most popular configurations.

3.1.2 Routing

The 3 switches set the source for that destination.

There are eight possible permutations of the switches. Up is 1, down is 0.

The group numbers may be changed to 5 to 8 if the module is set up for the high audio groups.

Switch #	2 or 6	3 or 7	4 or 8
De-embedded Group 1	0	0	0
De-embedded Group 2	0	0	**1**
De-embedded Group 3	0	**1**	0
De-embedded Group 4	0	**1**	**1**
AES inputs 1 & 2	**1**	0	0
AES inputs 3 & 4	**1**	0	**1**
AES inputs 5 & 6	**1**	**1**	0
AES inputs 7 & 8	**1**	**1**	**1**

Table 2: Source switch encoding

The AES ports which are configured as outputs are not available as sources. If the source is the same as the destination, the audio generator will be the source. Other invalid routing will use a muted signal as the source.

Groups may be 1-4 OR 5-8 !

The position of the DIP SW3.3 'High Group Mode' controls the Group numbers. Both the group sources and group destinations are changed if the switches SW3.3 & SW3.1 are on. In this case, the groups will be the extra audio groups in 3G video and all conventional audio groups will pass through the module.

3.1.3 Assigning the audio generator

It is assumed that the hardware switches will be used when the configurations are relatively straightforward but there are times when it is useful to use the internal tone generator as a source. This may be done by routing the destination to the corresponding direct source Examples.

1. embedder 1 from de-embedder 1.
2. AES 1&2 from AES 1&2 (also not possible).

This is not very intuitive and is mostly meant as an engineering debugging aid.

3.2 Other DIP Switches

Remember, the switch settings are only read when the module is powered up.

The three switches SW3.1-3 are always read. The other switches are only used if SW3.1 is on.

3.2.1 DIP config mode SW3.1

SW3.1 on, the DIP switch configuration is used. If there is a GYDA present, the switch configuration on the module will also overwrite the configuration stored in the GYDA controller.

SW3.1 off, will not use the DIP switches for routing. The module will be configured from either the stored configuration in the module or from GYDA if there is GYDA present. The configuration is stored when a GYDA configuration command is used. Therefore if a GYDA is present, the internal configuration may be overwritten by the GYDA controller.

The DIP switches control the routing and a couple of other important settings. Other stored settings, such as data embedding audio mixer and generator settings will always be used.

3.2.2 DMUX LED mode, SW3.2

The switch controls how the two audio LEDs function. If the switch is off, the LEDs show the AES status. The LED indicates input signals if the ports are used as inputs and output signal presence if the ports are outputs. If the switch is on, the LEDs show the presence of embedded groups.

The LEDs can be red, orange and green. Red indicates that none of the signals are present. Green indicates that all of the signals are present. Orange indicates that some of the signals are present. See chapter 5.1.

3.2.3 High group mode SW3.3

The embedders may be used as a normal 4 group embedder with all video formats OR it may be used to embed the extra audio groups available in 3G video formats. The groups numbered 5 – 8 in layer A video or the audio groups 1- 4 in the second stream of a dual link signal are regarded equivalent by the module. Group 5 in the user interface will be group 5 of layer A 3G video or group 1 in the second stream of a layer B signal.

If SW3.1(DIP config mode) & SW3.3 (High group mode) are **both on**:-

All DIP switches are used for configuration.

GYDA will only be able to monitor the card.

All group numbers for the DIP routing configuration will refer to the extra 3G audio groups. All the conventional embedded audio will pass through the module.

If SW3.1(DIP config mode) is **on** & SW3.3 (High group mode) is **off**:-

All DIP switches are used for configuration.

GYDA will only be able to monitor the card.

The extra 3G audio embedded audio will pass through the module.

If SW3.1(DIP config mode) is **off** & SW3.3 (High group mode) is **on**:-

The card is to be controlled by GYDA **or** the stored configuration is to be used.

The embedder mode may be either high or low groups. This is set in the configuration page of GYDA.

De-embedded audio from all 8 groups may be routed in the audio router.

All the conventional embedded audio will pass through the module.

If SW3.1(DIP config mode) & SW3.3 (High group mode) are **both off**:-

The card is to be controlled by GYDA **or** the stored configuration is to be used.

De-embedded audio from the conventional 4 groups may be routed in the audio router.

The extra 3G audio embedded audio will pass through the module.

3.2.4 Disable SRCs, SW3.4

The sample rate converters will not be used if this switch is on. The user must ensure that the AES input signals are locked to the video signal otherwise click noises will be produced in the embedded audio signals.

If the switch is off, the sample rate converters will be used when necessary.

3.2.5 Group remove, SW3.5

This switch controls whether existing embedded audio is re-embedded or removed.

When SW3.2 is on, the output video will only contain audio embedded by the module.

When SW3.2 is off, all existing embedded audio groups will be transported unless overwritten.

3G audio groups which are not handled by the module will always be transported.

3.2.6 Fallback generator control, SW3.6

This switch is used to control the outputs when the input signals are not present.

On: The Video output will be disabled if the input signal is removed.

The AES outputs will be disabled if the source routed to that output is not present.

The input presence of the AES signals is embedded in the embedded audio data packet so that an upstream AES input failure will disable an AES output which uses that embedded audio. *To summarize*: An AES input at an embedder input will control the muting at the output of the de-embedder.

Off: The internal video generator will be used as an input until a valid video signal is detected on one of the inputs. The AES outputs will always be on but the signal will be silent if the source is absent.

3.2.7 EDH insert, SW3.7

SD video output from the module will contain an EDH packet if this switch is on.

3.2.8 24 bit (SD), SW3.7

SD video will contain embedded audio with a word length of 24 bits if the switch is on.

SD video will contain embedded audio with a word length of 20 bits if the switch is off.

3G/HD video will always contain embedded audio with a word length of 24 bits.

3.3 DIP configuration examples

Routing by the DIP switches is easy if all the AES port directions are the same.

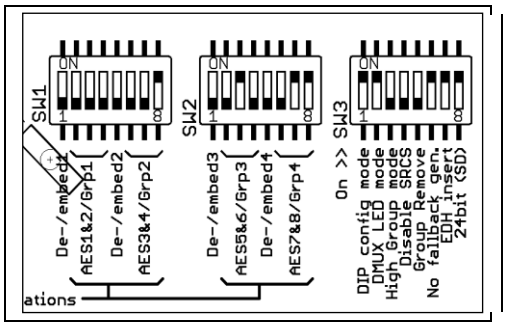


Figure 3: Example 1

The module above is set to de-embed all 4 audio groups.

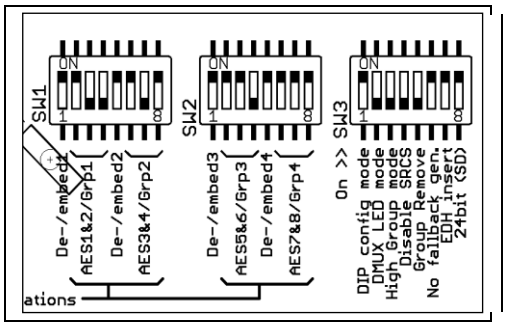


Figure 4: Example 2

The module above is set to embed all 4 audio groups.

It becomes more complicated if complex routing is required because the embedding of each group can only be done in one place; **E.G.** embed group1 can only be controlled with SW1.1-4. Route these first then use the unused switches to set up the de-embedding.

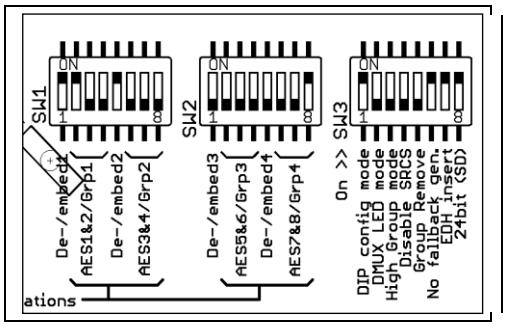


Figure 5: Example 3

The module above is set to:-

- Embed group 1 from AES 1&2.
- Embed group 2 with de-embedded group 1. ie move group 1 to 2.
- De-embed groups 1 to AES 5& 6 and group 2 to AES 7&8.

3.4 GYDA Control

Full control of the stereo audio router is possible with the GYDA system controller if the DIP switch SW3.1 is off. Direct control with SNMP is also possible with GYDA.

The module stores its configuration in non-volatile memory when a GYDA command is given. This allows a complex configuration to be restored after a power loss.

GYDA also stores the configuration of all the modules it controls. GYDA uses this to restore the configuration of a module if it is hot-swapped. This hot-swap re-configuration only occurs if the module is removed from a running system with an active GYDA. Modules that are hot-swapped must also be of the same type.

> AV-3G-XMUX reports one of two types to GYDA depending on the position of SW3.3 (High group mode). Off -> AV-3G-XMUX: On -> AV-3G-XLMUX
>
> SW3.3 must have the same setting for the modules involved in a hot-swap.

3.4.1 Audio Mixer

The audio mixer has eight channels.

Each mix channel has four input faders and an output delay. The delay is setting is common for the left and right channels.

The input faders are connected to the mixer matrix which has the same inputs as the main stereo audio router. The matrix is a stereo matrix so a further selection chooses the Left or Right or the phase inverted Left or Right channel.

The mix outputs are combined two at a time to form 4 stereo outputs. These are available in the audio matrices (main and mixer).

The mixer may be used for mono routing or down-mixing or even filtering and basic reverberation.

3.4.2 RS422 Data port configuration

The RS422 data backplane input must be configured with GYDA. The baud rate, data length, parity and stop bits must be configured if UART mode is used.

The router destination where the data is to be embedded must be set up and the source channel containing the received data that will be output on the backplane must be also be configured. See section 3.5.

3.4.3 Transport and shuffling of audio groups

The AV-3G-XMUX stereo *audio router* involves de-embedding, buffering and re-embedding which introduces a small delay relative to the video signal.

The group router is used to avoid this extra delay. Groups that only pass through the *group router* are re-embedded in the same video line. This avoids any extra delay and means that incompatible audio formats (asynchronous audio/ 96 kHz audio) may still be transported. The AV-3G-XMUX automatically uses transport mode whenever possible when controlled with the DIP switches.

“Shuffling” of groups is when existing embedded audio groups are re-assigned to different groups. Copying of groups is also possible i.e. Group 1 may be transported to Group 1 and duplicated to Group 2. This function also takes place in the *group router* which means that there is no extra delay.

There are 8 possible groups with 3G video but the AV-3G-XMUX has only 4 embedders so the group routing is only possible on either the low conventional groups or the high 3G groups.

3.4.4 Audio generator

The stereo audio generator is available in the audio router as a source. It is a high purity 1 kHz sine wave with a 250ms interruption on the left channel every 3 seconds. The audio level may be set to one of two standards. The two levels are -18 dBFS and -20 dBFS. These two levels correspond to EBU R68 and SMPTE RP 155.

3.4.5 Video generator

The video generator has several simple signals:

- Red, Green, Blue or Black full field.
- Color bar, 100% white, 75% colors, no set-up level.
- Color bar as above with moving black rectangle. The black rectangle turns to grey when the left audio tone is muted every 3 seconds. This may be used to help adjust timing errors between audio and video.

The generator may be used as the video source if there is no video signal present at either of the video inputs. The generator may also be switched on with GYDA. This will override video input but the generator signal will be locked to the input.

The video standard of the generator may be set with GYDA but only if there is no video input present.

3.4.6 Label generator

The module has a label generator which can either, generate up to two lines of 16 characters, or display ATC time code. The generator may be set to On, Off or Auto. The Auto setting switches the label on when the video generator is active.

3.4.7 Time code display

The label generator may also be used to display the value of ATC time code in the video. It then replaces the text label. The auto setting then has a special usage as the time code is not visible when video is present. The time code reader is active and the value displayed when the input video is removed, is the last seen time code.

3.4.8 Video input switching

The default mode of operation is auto-switch between the optical and electrical inputs when the optical input is present.

The module may be configured to either use the internal generator, or to switch off when no video is detected on the inputs.

The video generator may be selected to override the input video picture. The input video will decide the timing of the output video and any embedded packets will still be used by the module. Only the picture will be overwritten.

Upstream video switching will cause glitches in the digital video. The module will remove these glitches if the switch occurs on the correct video line for the standard in use. The input buffer is two video lines of the longest standard and starts in the middle. Subsequent switches will be transparent if the new signal is within a line from the original video. There will be a glitch on the output if the new video phase is outside of this range. The buffer will be re-aligned to the middle with the new signal phase.

3.5 Data transmission

The module can de-embed and embed asynchronous data. An AES3 audio signal, user bit channel is used as a carrier. Both embedded audio and normal AES3 signals may be used to carry the RS422 data. The fiber connection usually only goes one direction so any desired return path must be created by the user with another circuit. Return data may be sent over fiber via a link comprising of XMUX embedders, D422 or D422-MG modules. The return signal may also be carried on a normal copper AES signal.

The data input works in one of two modes:

1. UART Mode: The data is checked for correct reception according to the configuration. The data words are packaged and sent when present.
2. Raw sampling mode: The data input is sampled at 93.75 kHz and embedded as a data stream. No checking is performed.

3.5.1 Data latencies

The data channel has a total latency of approximately 900µs when using raw sampling. Normal data rates of up to 9600 may be used with raw data sampling to have a low latency. The latency is 2.6ms when using the normal data encoding due to the block structure of the AES User bits.

The configuration of the data channel is always stored in the module and used regardless of the GYDA override switch.

3.5.2 Embedding

The AV-3G-XMUX has a RS422 data input for the embedding of control data. The mode and other parameters are configured with GYDA. The factory default is UART mode, 115200 baud, no parity, and one stop bit.

The data channel is encoded in the User bits in an embedded audio stereo signal assigned with GYDA. The factory default is Audio channels 1&2 in Group 1.

3.5.3 De-embedding

The audio channel with the ‘data signal to be de-embedded’ must be configured by GYDA as there may be several data channels available.

The AV-3G-XMUX will automatically detect the data channel format when present and output the data on the backplane connector. The output driver will only be active when data is output in UART mode i.e. RS485. The output is always active when raw data mode is used.

3.5.4 Limitations

1. The normal UART mode checks the data when receiving and only embeds valid bytes. The data format must be correct. This also means that a BREAK condition of many spaces will not be detected or transmitted. Contact support if this is a requirement.

4 Connections

Three backplanes are available for the AV-3G-XMUX.

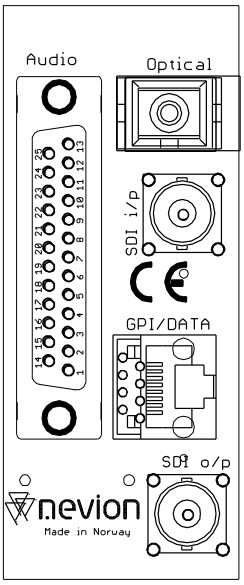


Figure 6: AV-3G-XMUX-C1

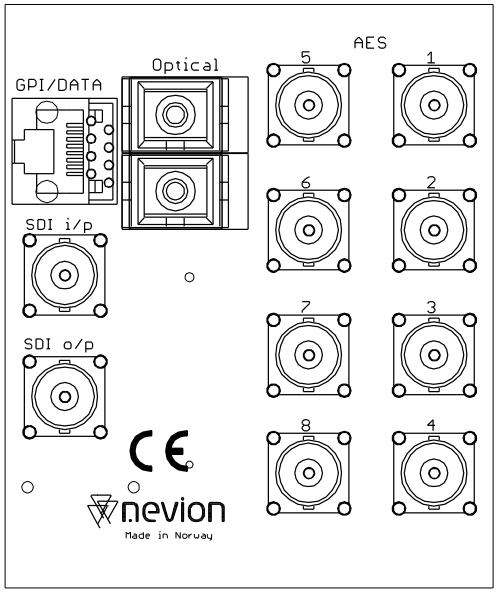
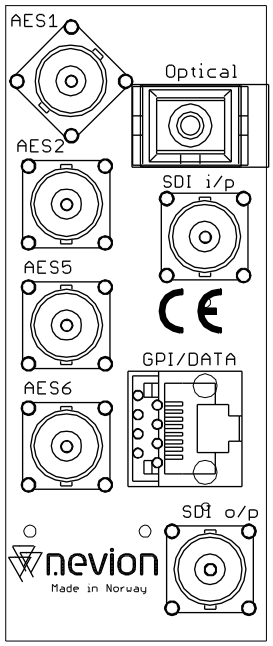


Figure 7: AV-3G-XMUX-C2



The C1 is the standard backplane/ connector module with BNC video electrical inputs and outputs. A 25 pin d-sub type connector is provided for the AES3 audio inputs and outputs. The pin configuration used is the industry standard DA-88 type so that commercially available 'snakes' may be used.

The AV-3G-MUX-C2 is a double width backplane/ connector module with all BNC audio and video electrical inputs and outputs available. It is also the only backplane with dual optical options. The audio connections follow the AES-3ID recommendation.

The AV-HD-XMUX-C3 is a single width backplane/ connector module with 4 BNC audio ports and video electrical inputs and outputs. One optical option may be used with this backplane. The audio connections follow the AES-3ID recommendation. It allows enables the use of the Flashlink N-box with AES on BNCs.

Figure 8: AV-3G-XMUX-C3

4.1 Summary

AV-3G-XMUX-C1:standard backplane:	1 optical, balanced AES3.
AV-3G-XMUX-C2 (double width):	2 optical, 8 BNC AES-3ID connections.
AV-3G-XMUX-C3	1 optical, 4 BNC AES-3ID connections.

4.2 Audio connections DB25

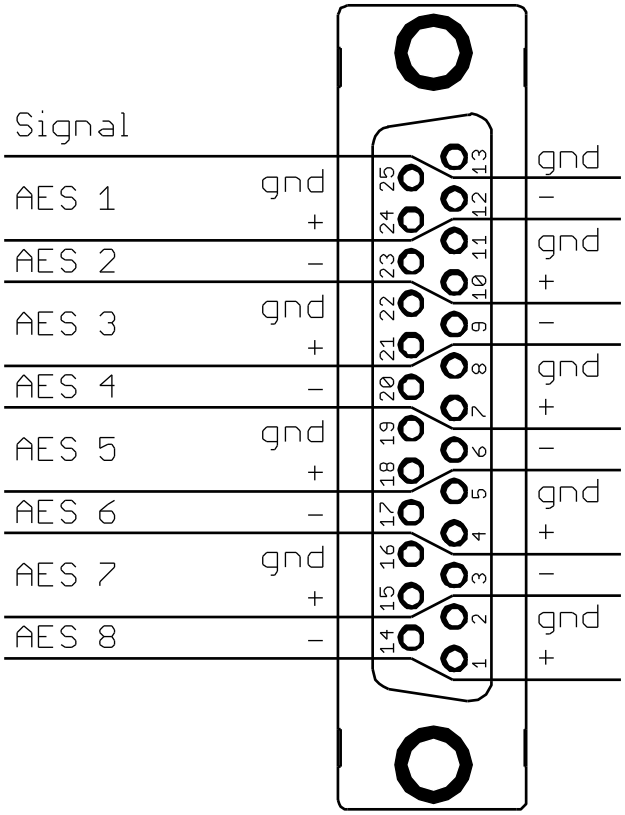


Figure 9: D-sub 25 audio connector wiring

4.3 Data/GPI connections

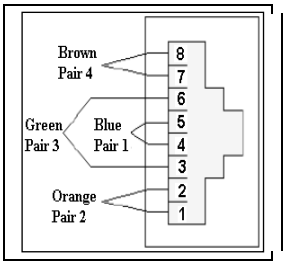


Figure 12: Pin layout

Pin number	Description
1	Status
2	No Video signal
3	Laser failure / Laser defeat
4	RS485/422 output +
5	RS485/422 output -
6	RS422 input +
7	RS422 input -
8	Ground

5 Operation

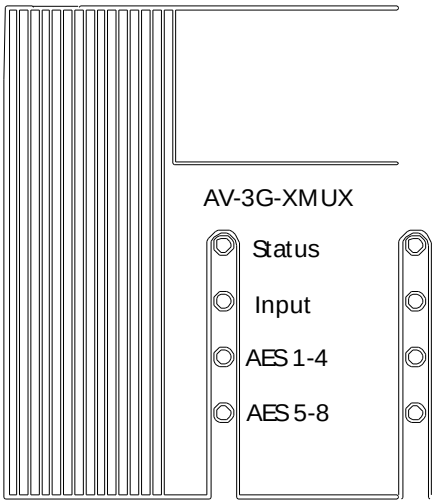


Figure 10: LED overview

(Text not printed on the front panel). Each module has 4 LED's. The colors of each of the LED's have different meanings as shown in the tables below.

5.1 Front panel LEDs

Diode \ state	Red LED	Orange LED	Green LED	No light
Status	PTC fuse has been triggered or FPGA programming has failed or laser has failed or is killed	Module has not been programmed	Module is OK	Module has no power
Input	Video signal absent.	Electrical video signal present	Optical video signal Present	Module has not been programmed
AES 1-4 SW3.2 off	AES 1,2,3 and 4 not present	Some of AES 1,2,3 and 4 present	AES signals 1,2,3 and 4 present	Module has not been programmed
AES 5-8 SW3.2 off	AES 5,6,7 and 8 not present	Some of AES 5,6,7 and 8 present	AES signals 5,6,7 and 8 present	Module has not been programmed
AES 1-4 SW3.2 on	Group 1 & 2 not present	Either group 1 or 2 present	Both group 1 & 2 present	Module has not been programmed
AES 5-8 SW3.2 on	Group 3 & 4 not present	Either group 3 or 4 present	Both group 3 & 4 present	Module has not been programmed

5.2 GPI alarms

Only three alarms are present on the 8P8C jack (RJ45) connector as four of the pins are used for the RS422 data port.

The three alarms are:

GPI1 Status (negative logic)

This alarm will be inactive if:-

1. The power is not present in the module.
2. The FPGA firmware is invalid.
3. The DWDM laser option has failed.

GPI2 Video signal lost

GPI3 Laser failure (DWDM option not fitted)

The alarm signals are open collector transistor switches.

An active condition means that the transistor is conducting.

The Status alarm should always be active during normal operation.

5.2.1 Laser kill GPI3 input

GPI3 is used as a GPI input to kill the laser output when the DWDM laser option is fitted.

Connection of the pin to 0V will switch off the laser.

The pins of several modules may be connected together to kill all of the lasers going into a multiplexer filter.

General environmental requirements for Nevion equipment

1. The equipment will meet the guaranteed performance specification under the following environmental conditions:
   - Operating room temperature range: 0°C to 45°C
   - Operating relative humidity range: <90% (non-condensing)
2. The equipment will operate without damage under the following environmental conditions:
   - Temperature range: -10°C to 55°C
   - Relative humidity range: <90% (non-condensing)

Product Warranty

The warranty terms and conditions for the product(s) covered by this manual follow the General Sales Conditions by Nevion, which are available on the company web site:

www.nevion.com

Materials declaration and recycling information

A.1 Materials declaration

For product sold into China after 1st March 2007, we comply with the “Administrative Measure on the Control of Pollution by Electronic Information Products”. In the first stage of this legislation, content of six hazardous materials has to be declared. The table below shows the required information.

組成名稱 Part Name	Toxic or hazardous substances and elements					
	鉛 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr(VI))	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
AV-3G-XMUX	O	O	O	O	O	O

O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.

X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.

This is indicated by the product marking:

A.2 Recycling information

Nevion provides assistance to customers and recyclers through our web site http://www.nevion.com/. Please contact Nevion’s Customer Support for assistance with recycling if this site does not show the information you require.

Where it is not possible to return the product to Nevion or its agents for recycling, the following general information may be of assistance:

- Before attempting disassembly, ensure the product is completely disconnected from power and signal connections.
- All major parts are marked or labeled to show their material content.
- Depending on the date of manufacture, this product may contain lead in solder.
- Some circuit boards may contain battery-backed memory devices.

EC Declaration of Conformity

MANUFACTURER	Nevion Europe AS P.O. Box 1020, 3204 Sandefjord, Norway	
AUTHORIZED REPRESENTATIVE (Established within the EEA)	Not applicable	
MODEL NUMBER(S)	AV-3G-XMUX (-T/R)	
DESCRIPTION	HD/SD digital audio embedders and de-embedders	
DIRECTIVES this equipment complies with	LVD 73/23/EEC EMC 2004/108/EEC	
HARMONISED STANDARDS applied in order to verify compliance with Directive(s)	EN 55103-1:1996 EN 55103-2:1996	
TEST REPORTS ISSUED BY	**Notified/Competent Body**	**Report no:**
	-	-
TECHNICAL CONSTRUCTION FILE NO	Not applicable	
YEAR WHICH THE CE-MARK WAS AFFIXED	2011	
TEST AUTHORIZED SIGNATORY		
MANUFACTURER	**AUTHORIZED REPRESENTATIVE (Established within EEA)**	**Date of Issue**
		2011-08-25
		Place of Issue
	Not applicable	Sandefjord, Norway

NEVION EUROPE AS
O.nr. 976 584 201 MVA

Name Thomas Øhrbom

Position QA Director, Nevion Europe
(authorized signature)