USER MANUAL

Synapse GDK100

Dual Background Input 3GB/S, HD, SD SDI Downstream Keyer with Preview Output

Version 1.00 | November 2021

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General Information

ALWAYS disconnect your entire system from the AC mains before cleaning any component. The product frame (SFR18, SFR08 or SFR04) must be terminated with three-conductor AC mains power cord that includes an earth ground connection. To prevent shock hazard, all three connections must always be used.

NEVER use flammable or combustible chemicals for cleaning components.

NEVER operate this product if any cover is removed.

NEVER wet the inside of this product with any liquid.

NEVER pour or spill liquids directly onto this unit.

NEVER block airflow through ventilation slots.

NEVER bypass any fuse.

NEVER replace any fuse with a value or type other than those specified.

NEVER attempt to repair this product. If a problem occurs, contact your local EVS distributor.

NEVER expose this product to extremely high or low temperatures.

NEVER operate this product in an explosive atmosphere.

To reduce the risk of fire or electrical shock, do not expose this appliance to rain or moisture.

This product complies with the requirements of the product family standards for audio, video, audio-visual entertainment lighting control apparatus for professional use as mentioned below.

CE	EN60950	Safety
	EN55103-1: 1996	Emission
	EN55103-2: 1996	Immunity

Tested to comply with FCC Standards

FOR HOME OR OFFICE USE

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Contents

ICONOGRAPHY

	Note		Tip		Warning

What's New?

In the User Manual the icon NEW ! has been added on the left margin to highlight information on updated features.

The changes linked to new features in version 1.00 of GDK100 are listed below.

SMPTE ST 352 Payload Identifier

- See section "Control" on page 10.

1. Introduction

Synapse is a modular system designed for the broadcast industry. High density, intuitive operation and high-quality processing are key features of this system. Synapse offers a full range of converters and processing modules. Please visit the EVS website at www.evs.com to obtain the latest information on our new products and updates.

Local Control Panel

The local control panel gives access to all adjustable parameters and provides status information for any of the cards in the Synapse frame, including the Synapse rack controller. The local control panel is also used to back-up and restore card settings. Please refer to the RRC18, RRC10, RRC04, RRS18 and RRS04 manuals for a detailed description of the local control panel, the way to set up remote control over IP and for frame-related settings and status information.

Remote Control Capabilities

The remote-control options are explained in the rack controller (RRC18 / RRC10 / RRC04 / RRS18 / RRS04 / ERC108-118 / ERS108-118) manuals. The method for connecting to a computer using Ethernet is also described in the ERC/ERS/RRC/RRS manuals.

Cortex software will increase system flexibility of one or more Synapse frames.

Although it is not required to use Cortex with a Synapse frame, you are strongly advised to use a remote personal computer or laptop PC with Cortex installed, as this increases the ease of use and understanding of the modules.

2. Unpacking and Placement

Unpacking

The EVS Synapse card must be unpacked in an anti-static environment. Care must be taken NOT to touch components on the card – always handle the card carefully by the edges. The card must be stored and shipped in anti-static packaging. Ensuring that these precautions are followed will prevent premature failure of components mounted on the board.

Placing the Card

The Synapse card can be placed vertically in an SFR18 frame or horizontally in an SFR04 and SFR08 frame. Locate the two guide slots to be used, slide in the mounted circuit board, and push it firmly to locate the connectors.

Correct insertion of the card is essential, as a card that is not located properly may show valid indicators, but will not function correctly.

On power up, all LEDs will light up for a few seconds. This is the time it takes to initialize the card.

3. Quick Start

Powering Up

On powering up the Synapse frame, the card set will use basic data and default initialization settings. All LEDs will light up during this process. After initialization, several LEDs will remain lit – the exact number and configuration is dependent upon the number of inputs connected and the status of the inputs.

Default Settings

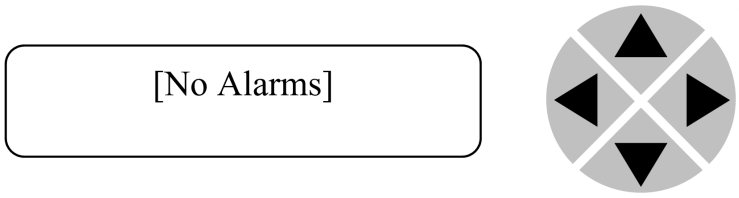
In its default state, the GDK100 acts as a back-up switcher with only the carrier detector active.

3.1. Changing Settings and Parameters

The front panel controls or Cortex can be used to change the settings. An overview of the settings can be found in later chapters of this manual. Please refer to "Settings Menu" on page 10, "Status Menu" on page 16 "Graphical User Interface" on page 1 and "Events Menu" on page 18.

Front Panel Control

Front Panel Display and Cursor



Settings are displayed and changed as follows:

Use the cursor 'arrows' on the front panel to select the menu and parameter to be displayed and/or changed.

▶ Move forward through the menu structure.

◀ Go back through the menu structure.

▲ Move up within a menu, or increase the value of a parameter.

▼ Move down through a menu or decrease the value of a parameter.

When editing parameters, pressing ▶ twice will reset the value to its default setting.

How to Change Parameters Using the Front Panel Control

With the display as shown below:

```
RRC18 [Select Card]
>S01=SFS10
```

Pressing ▶ selects the SFS10 in frame slot 01.

The display changes to indicate that the SFS10 has been selected. In this example the Settings menu item is indicated.

```
SFS10 [Select Menu]
>Settings
```

Pressing the ▶ selects the menu item shown, in this example Settings.

(Pressing ▲ or ▼ will change to a different menu, e.g. Status, Events).

The display changes to indicate that the SFS10 Settings menu item SDI-Format has been selected and shows that its current setting is Auto.

```
SFS10 [Settings]
>SDI-Format=Auto
```

Pressing the ▶ selects the Settings item shown, in this example SDI-Format.

(Pressing ▲ or ▼ will change to a different setting, e.g. Mode, H-Delay).

The display changes to indicate that the SFS10 Edit Setting menu item SDI-Format has been selected.

```
SFS10 [Edit Setting]
SDI-Format>Auto
```

To edit the setting of the menu item, press ▲ or ▼.

All menu items can be monitored and/or changed in this way. Changing a setting has an immediate effect.

Menu Structure Example

Slot	Module		Item		Parameter		Setting
▲							
▲							
S02			Identity				
▲			▲				
S01	SFS10	►	Settings	►	Standard dig	►	Auto
▼			▼		▼		▼
S00	RRC18		Status		Mode		625
			▼		▼		▼
			Events		Ref-Input		525
					▼		
					H-Delay		
					▼		
					▼		

3.2. Using Cortex with Synapse

EVS Cortex Software

Cortex can be used to change the settings of Synapse modules from a PC, either locally or remotely. The software enables communication based on TCP/IP between the Setup PC and Synapse frames/modules.

Each Synapse frame is addressed through its rack controller's unique IP address, giving access to each module, its menus and adjustment items. Cortex has access to data contained within the Synapse module and displays it on a GUI. The software has an intuitive structure following that of the module that it is controlling.

For operation of Cortex, please refer to the Cortex help files.

Further information about Front Panel Control and Cortex can be obtained from the ERC, ERS, RRC and RRS operational manuals and the Cortex help files.

4. The GDK100 Card

Introduction

The GDK100 is a Keyer module for the Synapse system. This module has 4 individual triple rate (SD, HD, 3Gb/s) inputs and 4 triple rate outputs. A local Ethernet connection is placed for controlling the end product. Depending on the connector panel you have either Ethernet or GPI control:

- GPI with BPH17 or BHX17
- Ethernet with BPH19 or BHX19 (for fast updates).

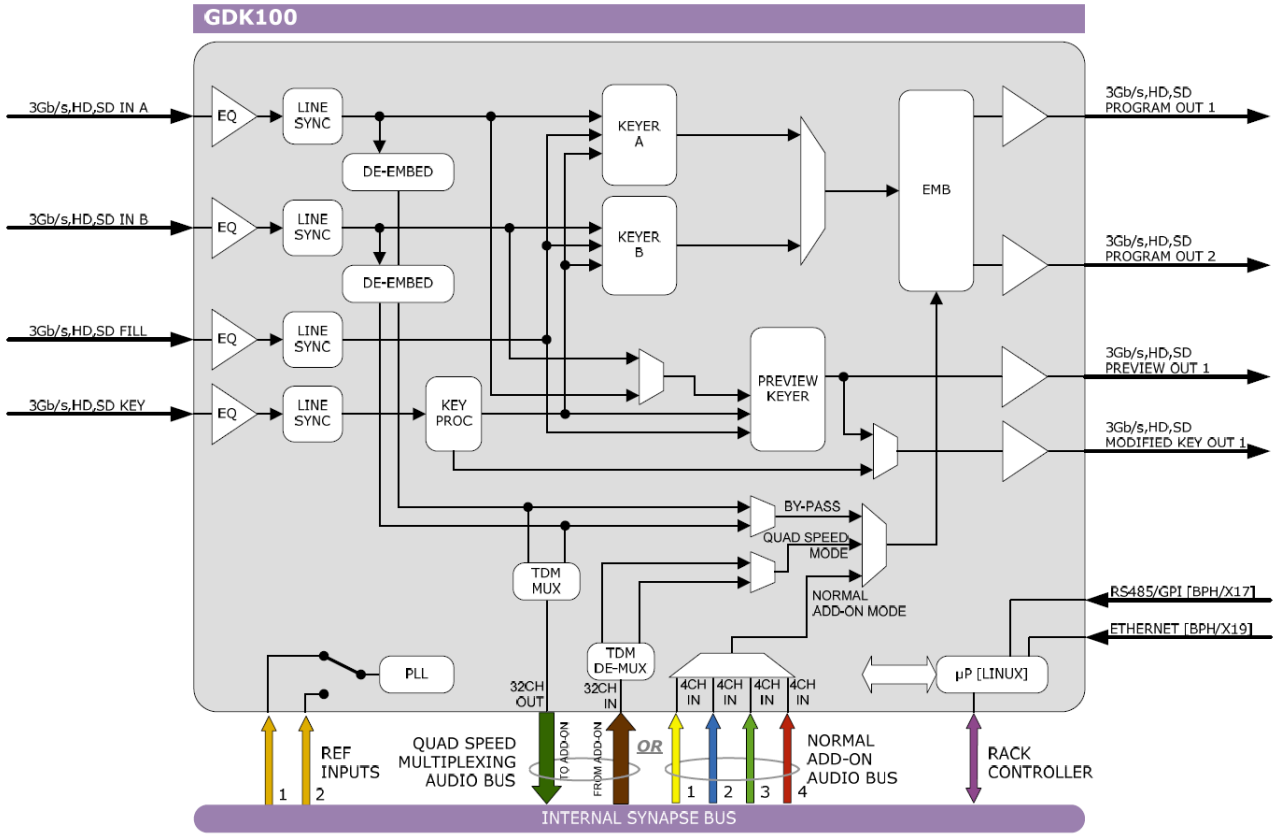
Features

- 2 background inputs (selectable, mixable)
- Key input
- Fill input
- Self key
- The 4th output can be software configured for any output task: program, preview or modified key output.
- Key gain, slice level, transparency (with definable) modified key monitor output)
- Preview output for content verification prior to going on air
- Transparent for 16 channels of embedded audio
- Transparent for all ANC data
- Compatible with:
  - 270 Mbit/s (SMPTE 259M) 50 / 59.94Hz
  - 1485 Mbit/s (SMPTE 292M) 50 / 59.94Hz
  - 2970 Mbit/s (SMPTE 424M) =3Gb/s 50 / 59.94Hz.

Applications

The GDK100 can be used as a downstream keyer for external logo generated keying and other graphical overlay keying.

Block Schematic

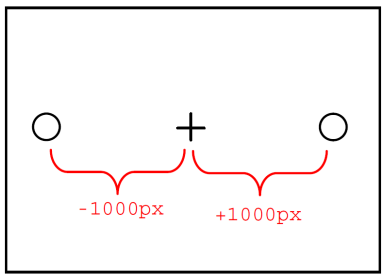


Important Notice About Input Specifications

The GDK100 does not have a built-in frame synchronizer. Therefore it is up to the system engineer to synchronize the inputs before feeding them to the keyer card. All inputs have to fall within the following specifications:

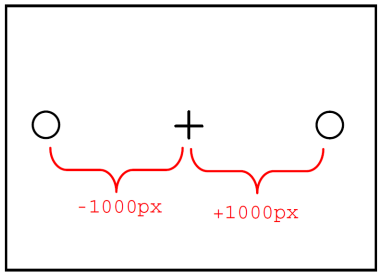
1080p

1000 pixels (6.756 µs) in front of or behind the reference (which is fed to the GDK card via the rack controller).



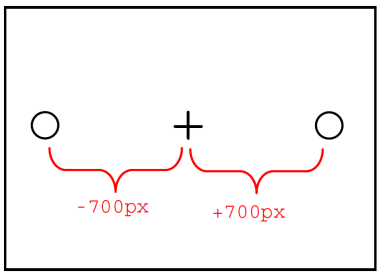
1080i

1000 pixels (13.5 µs) in front of or behind the reference (which is fed to the GDK card via the rack controller).



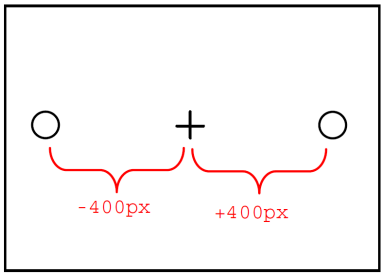
720p

700 pixels (9.42 µs) in front of or behind the reference (which is fed to the GDK card via the rack controller).



SD

400 pixels (29.62 µs) in front of or behind the reference (which is fed to the GDK card via the rack controller).



Important Notice About Output Delays

The keyer card adds a slight delay to the outputs in comparison to the inputs. These are the measured delays per format:

Format	Measured delay
1080p	Not measured
1080i	2 lines delay, ±11.89 µs
720p	3 lines delay, ±8.46 µs
SD	1 line delay, ±23.9 µs

5. Settings Menu

5.1. Introduction

The Settings menu displays the current state of each GDK100 setting and allows you to change or adjust it.

Settings can be changed using the front panel of the Synapse frame (SFR18, SFR08 or SFR04) or with Cortex. The SCP08 control can also be used. Please refer to "Quick Start" on page 3 for information on the Synapse front panel control and Cortex.

5.2. Control

Setting	Description
Inp_Format	With Inp-Format you can set the input format. Possible settings are: • 1080p60 • 1080p50 (default) • 1080i60 • 1080i50 • 720p60 • 720p50 • SD525 • SD625 The default setting for this item is 1080p50.
Lock-Mode	Lock-Mode determines whether the card is locked to reference Ref1 or Ref2. By default it is set to Ref1.
Ref-Type	The GDK100 is able to lock onto an HD sync 600mV nominal Tri-level as described in the SMPTE 274M and 296m spec. An SD sync 300 mV nominal Bi-level sync can also be used. Ref-Type sets the type of reference to Tri-level or Bi-level. The default setting is Bi-level.

NEW !

SMPTE ST 352 Video Payload Identifier

The SMPTE ST 352 Video Payload Identifier, also known as VPID, is transported within the ancillary data of an SDI stream. The ancillary packet is placed in the HANC space. This packet contains 4 bytes of data.

There are two versions of the standard. The first was published in 2011 and the second in 2013. The revision can be seen within the 4 bytes.

When the GDK100 is not processing the incoming VPID packets, they will be passed transparently. When it generates the packets, the GDK100 will output VPID packets using the 2013 standard.

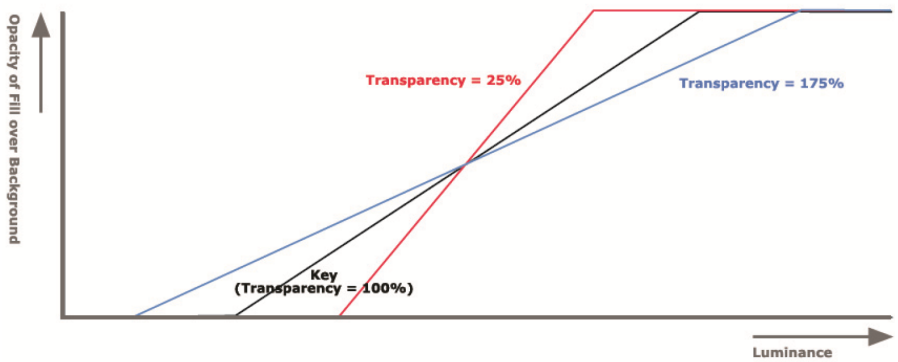
S352_Insert	S352_Insert enables the Video Payload Identifier insertion in the HANC space. It enables the user to insert or passthrough (On) the S352 Dynamic range and colorspace payload. When this menu item is set to On (default), it will generate a SMPTE ST352-2013 packet and overwrite the existing one (for both Luminance and Chrominance).When it is set to Off, it will pass the packet to the output as-is (only on Luminance).In HD 1080i for ATC-LTC transparency, the user may switch it Off to pass the ATC-LTC HANC packet on line 10.
Output-Matrix	This setting will only work if S352_Insert is set to On. It enables you to set the colorspace in REC709 (default) or REC2020. When set to either REC709 or REC2020, the S352 data is included in the s352 packet. (This does not change anything in the picture.)
HDR_Curve_Out	The dynamic range is the range of information between the lightest and darkest part of an image, also known as an image's luminosity. This setting enables you to set the dynamic range in standard dynamic range SDR (default), HLG, PQ or SLOG3. With all of these settings, the S352 data is included in the S352 packet. (This does not change anything in the picture.)
Bit_Depth_Out	Bit depth is the range of bits being used. This setting enables you to set the bit depth to Narrow (8bits) or Full (10bits). When set to either Narrow (default) or Full, it includes this data in the S352 packet. (This does not change anything in the picture.)
Add-On-Mode	With this setting you can set the Synapse Add-on bus mode to Quad speed audio (**Quad_Speed**) or to **Normal** mode. Default is Quad_Speed. For a detailed description of the quad speed audio mode, please refer to "Quad Speed ADD-ON Bus" on page 1.
GPI-Ctrl	GPI_Ctrl can be set to Latch, Non_Latch or Separated. Latch when a contact is closed momentarily (edge triggered), non_latch when a contact is closed all the time (level triggered). Set to Latch or non-Latch will trigger both the preview output and the program output. Set to Separated GPI 0 triggers the program output and GPI 1 triggers the preview output, both in a latching mode. Default is Latch. Please refer to "GPI Pinning" on page 23for the GPI pin assignment.
Output 4	The GDK100 has a fourth SDI output whose output can be user-defined. You can choose to make this a third Program output, a second Preview output, or an output with a Modified key. By default it is set to Program.

5.3. Keyer Options

Setting	Description
Keyer	With this setting you decide how you want the keyer to work. Choices are: • Key_input: Use the key as inserted on the key-input. • Self_key: Key using the signal from the fill input, without making use of a key-input (hard keying). • Key_invert: Use the key as inserted on the key-input, but inverted. • Forces_shape: This mode will only fade down the background with the corresponding key level and will insert the fill signal without changing this at all.
Prgm-Key	This item sets the key on or off for the program outputs. Set to GPI will enable the program keyer to be switched on or off by GPI-0 closures (please refer to "Connector Panels"). Default is On.
Prgm_Key_in	With this setting you can select how long the fade in of the program-key should be when a new key is triggered. This can be between 0 frames and 200 frames. Default is 0 frames.
Prgm_Key_out	With this setting you can select how long the fade out of the program-key should be when a new key is triggered. This can be between 0 frames and 200 frames. Default is 0 frames.
Prev-Key	With this item you can set the key on or off on the preview output(s). Set to GPI will enable the preview keyer to be switched on or off by GPI-1 closures (refer to chapter 10: GPI pinning). Default is Off.
Prev_Key_in	With this setting you can select how long the fade in of the preview-key should be when triggered. This can be between 0 frames and 200 frames. Default is 0 frames.
Prev_Key_out	With this setting you can select how long the fade out of the preview-key should be when a new key is triggered. This can be between 0 frames and 200 frames. Default is 0 frames.
Program_out	With Program_out you set either SDI-1 or SDI-2 as background source on the program output. Can also be set to GPI, in which case Program_out is switched between SDI-1 and SDI-2 by GPI-3 closures (refer to chapter 10: GPI pinning). Default is SDI-1.

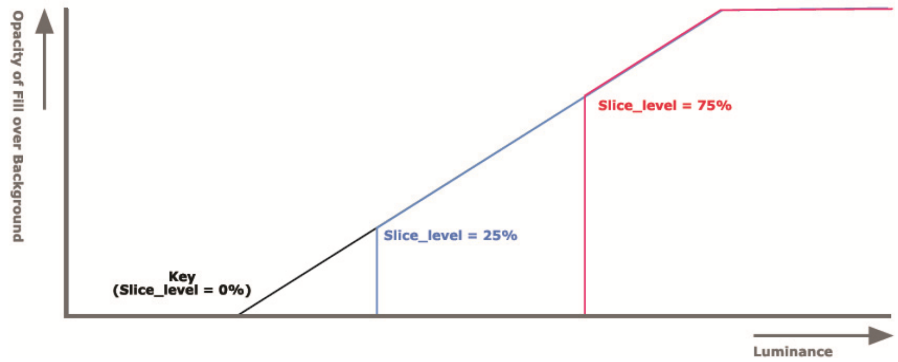
Preview_out	With Preview_out you set either SDI-1 or SDI-2 as background source on the preview output. Can also be set to GPI, in which case Preview_out is switched between SDI-1 and SDI-2 by GPI-3 closures (refer to chapter 10: GPI pinning). When both Program_out and Preview_out are set to GPI, both settings will be switched when GPI-3 is closed. Default is SDI-2.
Transparency	With this setting you can increase or decrease the transparency of the fill image. Can be set between 0% and 199%. Default is 100%. The following graph shows how the transparency setting modifies the key (with Keyer set to Key_input).

Transparency setting visualised:



Slice_level	With this setting you set a point in percentage in the keywhere the fill input should be cut off entirely. The default for this setting is 0%. The following graph shows how Slice_level modifies the key (with Keyer set to Key_input).

Slice_level setting visualised:



KEY_win_H_START	With the KEY_win settings you can set a window in the input signal where the key should be processed only. With H_Start you set the horizontal start point of this window (See appendix 1: Key_win settings visualized). By default it's set to 0%.

KEY_win_H_STOP	With the KEY_win settings you can set a window in the input signal where the key should be processed only. With H_Stop you set the horizontal end point of this window (See appendix 1: Key_win settings visualized). By default its set to 100%.
KEY_win_V_START	With the KEY_win settings you can set a window in the input signal where the key should be processed only. With V_Start you set the vertical start point of this window (See appendix 1: Key_win settings visualized). By default it's set to 0%.
KEY_win_V-STOP	With the KEY_win settings you can set a window in the input signal where the key should be processed only. With V_Stop you set the vertical end point of this window (See appendix 1: Key_win settings visualized). By default its set to 100%.
Audio_A	With this setting you can set the source of the audio on channel A. Can be SDI1 (SDI input 1) SDI2 (SDI input 2), AddOnA (first group of 16 channels on the AddOn bus) or AddOnB (second group of 16 channel on the AddOn bus). Default is SDI1.
Audio_B	With this setting you can set the source of the audio on channel B. Can be SDI1 (SDI input 1) SDI2 (SDI input 2), AddOnA (first group of 16 channels on the AddOn bus) or AddOnB (second group of 16 channel on the AddOn bus). Default is SDI2.

5.4. Embedder

Setting	Description
Emb_A_Sel ~ Emb_D-Sel	With these items you can set the embedder to either insert the audio into the corresponding group (fixed for embedder A, B, C and D to respectively group 1, 2 3 and 4) or to disable the embedder. By default it's set to its corresponding group.

5.5. De-Embedder

Setting	Description
Phase_Rst	If this setting is set to **On**, the card ensures audio-phase alignment between multiple audio channels and audio groups, which is necessary for multi-channel (surround) purposes. If errors in the signal-chain occur the de-embedder blocks reset synchronously to maintain audio-phase-alignment. If this setting is set to **Off**, the card eats-all audio including errors. Even if there are DBN/ANC/ECC or channel-sequence errors, the de-embedder will pass them. Be aware that audio-phase-alignment between multiple audio channels and audio groups cannot be maintained if this setting is set to **Off**.

This setting can be helpful to solve problems in the field using equipment which doesn't follow the standards correctly.

5.6. Network

Setting	Description
IP_Conf0	With this setting you can either let the card obtain an IP address automatically via DHCP, or assign an IP address manually. By default this is set to DHCP.
mIP0	When IP_Conf0 is set to manual, you can enter the preferred IP address here. By default it is set to 0.0.0.0
mNM0	When IP_Conf0 is set to manual, with this setting you can set a Netmask. Default is 0.0.0.0
mGW0	With IP_Conf0 set to manual, this setting lets you set a Standard Gateway. Default is set to 0.0.0.0.
NetwPrefix0	Here you can set the specific network prefix if required.

6. Status Menu

6.1. Introduction

The Status menu provides information about the current status of each item listed below.

6.2. System Status

Item	Description
sInp1	This status item indicates the presence and format of a valid signal in input 1. This is displayed as: • 1080p60 • 720p60 • 1080i60 • 1080p50 • 720p50 • 1080i50 • 1080p30 • 720p30 • 1035i60 • 1080p25 • 720p25 • SD625 • 1080p24 • 720p24 • SD525 • NA
sInp2	This status item indicates the presence and format of a valid signal in input 2. This is displayed as listed under sInp1.
sInp3	This status item indicates the presence and format of a valid signal in input 3. This is displayed as listed under sInp1.
sInp4	This status item indicates the presence and format of a valid signal in input 4. This is displayed as listed under sInp1.
AudioA-Present	This item displays the present audio groups on input A. This is displayed as '_ ___' when no audio is available and as '1234' when all audio groups are present. '1_3_' for instance displays that there's audio available in groups 1 and 3.
AudioB-Present	This item displays the present audio groups on input B. This is displayed as '_ ___' when no audio is available and as '1234' when all audio groups are present. '1_3_' for instance displays that there's audio available in groups 1 and 3.
GPI	This item displays the currently active GPI value (0 to 16383). 0 indicates that no GPI input is active.
Ref	Displays whether a correct reference is found (Present) or not (NA).

6.3. Net Status

Item	Description
IP_Addr0	This item displays the status of the IP address. It can be manual, DHCP asking (default), DHCP Leased or DHCP Infin.
MAC0	This item displays the MAC address of the card.
IP0	This item displays the current IP address of the card.
NM0	This item displays the current Netmask of the card.
GW0	This item displays the current Standard Gateway of the card.

7. Events Menu

Introduction

An event is a special message that is generated on the card asynchronously. This means that it is not the response to a request to the card, but a spontaneous message.

What is the Goal of an Event?

The goal of events is to inform the environment about a changing condition on the card. A message may be broadcast to mark the change in status. The message is volatile and cannot be retrieved from the system after it has been broadcast. There are several means by which the message can be filtered.

The events reported by the GDK100 card are as follows:

Menu Item	Description
Announcements	Announcements is not an event. This item is only used for switching the announcement of status changes on/off. 0=off, other =on
Input1 ~ Input4	Input1 to Input4 can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting.
Ref-Status	Reference can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting.

What Information is Available in an Event?

The message consists of the following items:

- A message string to show what has happened in text, for example: “INP_LOSS”, “REF_LOSS”, “INP_RETURN”.
- A tag that also shows what happens, but with a predefined number: e.g. 1 (= loss of input), 2 (= loss of reference), 129(= 1+128 = return of input). For a list of these predefined tags, please see the table below.
- A priority that marks the importance of an event. This value is defined by the user and can have any value between 1 and 255, or 0 when disabled.
- A slot number of the source of this event.

Message String

The message string is defined in the card and is therefore fixed. It may be used in controlling software like Synapse Set-up to show the event.

Tags

The tag is also defined in the card. The tag has a fixed meaning. When controlling or monitoring software has to make decisions based on events, it is easier to use the tag instead of interpreting a string. The first implementation is the tag-controlled switch in the GPI16.

In cases where the event marks a change to an error status (e.g. 1 for Loss of Input), the complement is marked by the tag increased by 128 (80hex), (e.g. 129 (81hex) for Return of Input).

The tags defined for the GDK100 card are:

Event Menu Item	Tag		Description
Announcements	01_{hex}=Announcements on	81_{hex}=Announcements off	Announcement of report and control values
Input1	01_{hex}=INP1_LOSS	81_{hex}=INP1_RETURN	Input 1 lost or returned
Input2	12_{hex}=INP2_LOSS	92_{hex}= INP2_RETURN	Input 2 lost or returned
Input3	13_{hex}=INP3_LOSS	93_{hex}=INP3_RETURN	Input 3 lost or returned
Input4	52_{hex}=INP4_LOSS	$d2_{hex}$= INP4_RETURN	Input 4 lost or returned
Ref-Status	02_{hex}=REF_LOSS	82_{hex}=REF_RETURN	Reference lost or returned

Priority

The priority is a user-defined value. The higher the priority of the alarm, the higher this value will be. Setting the priority to Zero disables the announcement of this alarm. Alarms with priorities equal to or higher than the Error Threshold setting of the RRC will cause the error LED on the Synapse rack front panel to light up.

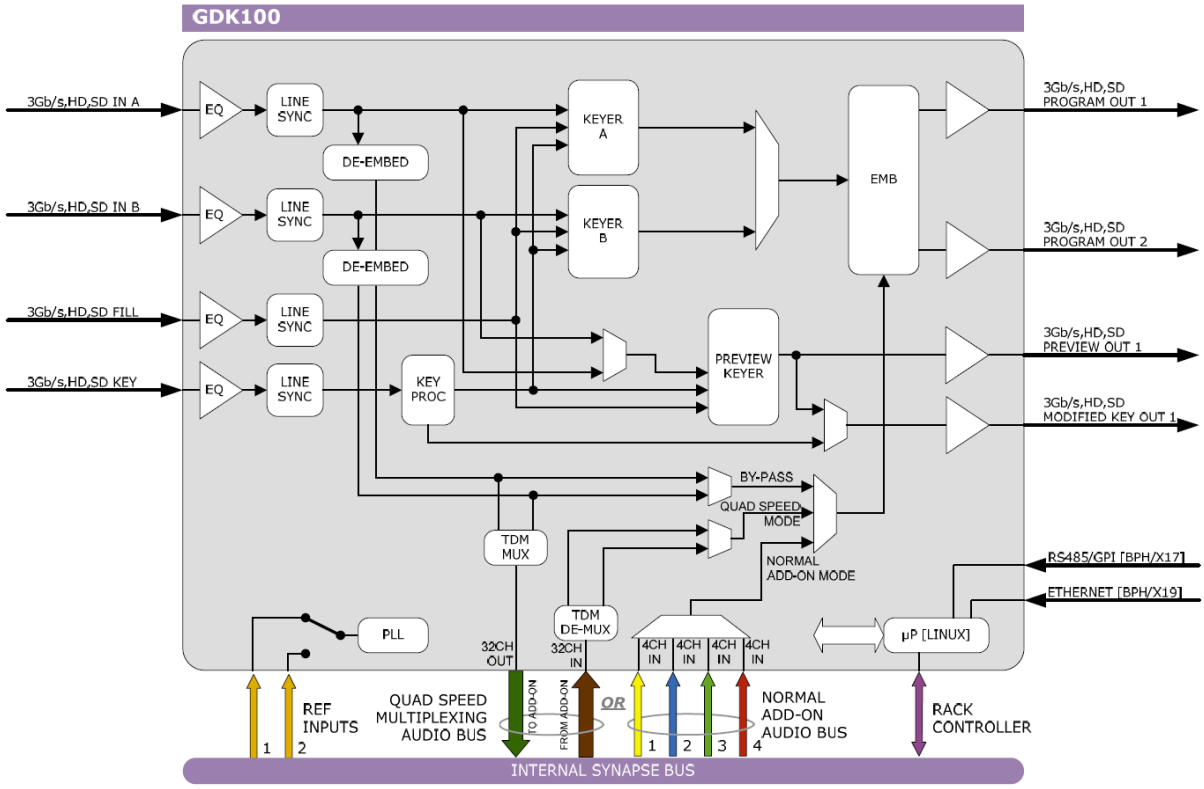
Card Address

Together with the message string or the tag, the slot number or address of the card is relevant to be able to assign the event to a certain card.

8. LED Indication

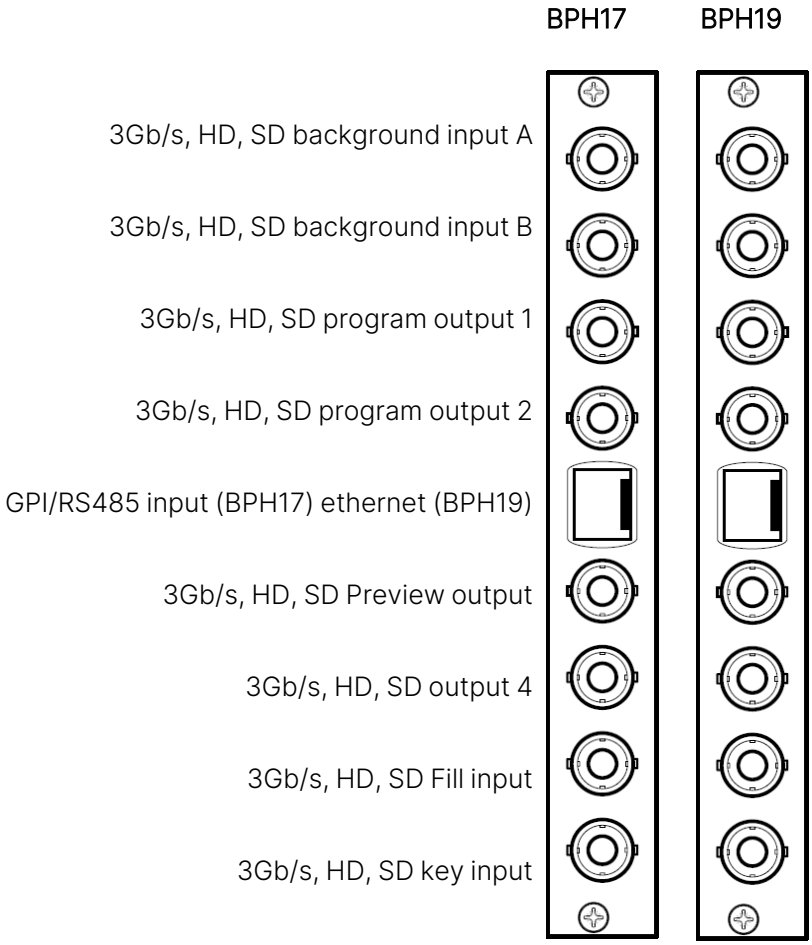
Indicator	Description
Error LED	The error LED indicates an error if the internal logic of the card is not configured correctly or has a hardware failure.
Input1 LED	This LED indicates the presence of a valid SDI video signal on input 1.
Input2 LED	This LED indicates the presence of a valid SDI video signal on input 2.
Input3 LED	This LED indicates the presence of a valid SDI video signal on input 3.
Input4 LED	This LED indicates the presence of a valid SDI video signal on input 4.
ANC Data LED	Indicates the presence of embedded audio within the input signal.
Reference LED	Indicates the presence of a valid reference signal on the selected reference input connector (ref-1 or ref-2).
Data Error LED	This LED indicates a CRC error.
Connection LED	This LED lights up after the card has initialized. The LED lights up for 0.5 seconds every time a connection is made to the card.

9. Block Schematic



10. Connector Panels

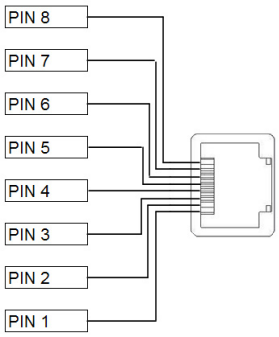
The GDK100 can be used with the BPH17 or BPH19.



For fiber connectivity, see www.evs.com

Unused inputs and outputs must be terminated with the correct impedance.

GPI Pinning

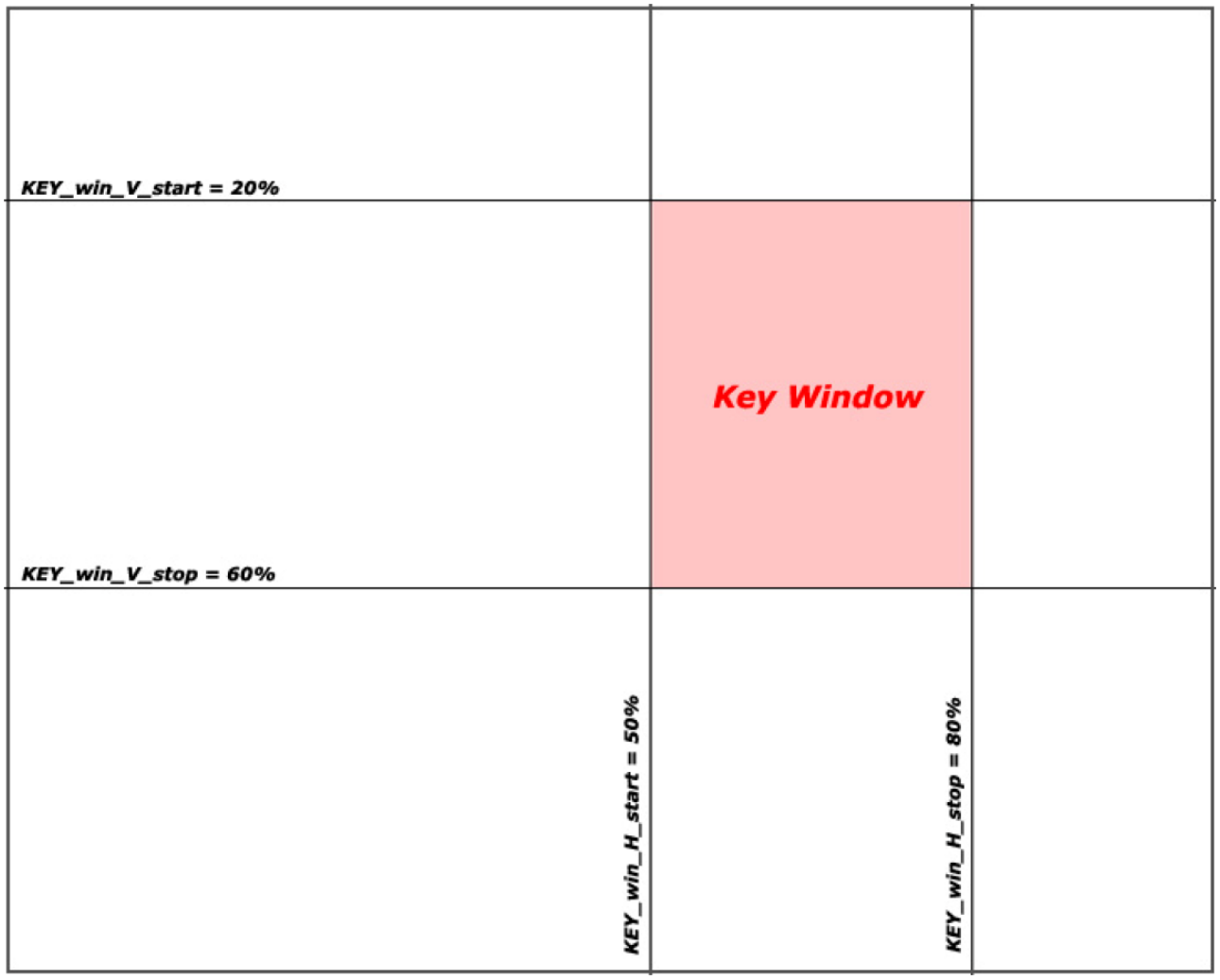


Pin	Function
1	GPI input 0
2	GPI input 1
3	RS485 TXA
4	RS485 RXA
5	RS485 RXB
6	RS485 TXB
7	GPI 3
8	Ground

Appendices

Appendix 1: KEY_win Settings Visualized

The settings regarding the key window (KEY_win_H_start, KEY_win_H_stop, KEY_win_V_start and KEY_win_V_stop) can be visualized as follows:



Only the area marked red will be keyed.

Appendix 2: Quad Speed ADD-ON Bus

Scope

The internal audio ADD-ON bus needs an upgrade for certain applications. We want more channels (32 per video stream seems possible in the near future). And we want the bus to be bidirectional, i.e. 32 channels in and 32 channels out at the same time.

The new interface needs to be compatible with all existing hardware (frames) and in the implementation of the master card it needs to be backward compatible with the original ADD-ON bus.

The master card has two modes:

- Normal ADD-ON mode, or
- Quad Speed audio ADD-ON mode.

These modes are selectable on the master card. If a mode is selected, all ADD-ON cards to that master need to be in the same mode.

You can mix master cards in one frame using the two different modes, but all cards to the right of the master must be in the same mode as the master. A new master breaks the chain and the master card ADD-ON mode can be selected again.

Features

- Up to 32 channels output from the master card, with looping to up to 3 ADD-ON cards

  The ADD-ON card chooses the channels it wants to process.
- Up to 32 channels input on the master card

  If the master card can handle less then 32 channels, the lowest channel numbers will be used, as the ADD-ON card will always generate 32 channels (where some channels can be empty or silent).
- Channel shuffling is done in the ADD-ON card.

  The master card has only one setting to enable the quad speed audio bus.
- Every Quad-Speed ADD-ON card takes 32 channels from the 'right hand ADD-ON card' and adds (or overwrites) the local processed channels.

  This can be done for any of the channels that are processed in the ADD-ON card.
- Some master cards are switchable between normal and quad-speed bus.
- Channel designations on the block schematics:

  Channel 1-32 (or less) are injected into the large, dark green arrow from the master card to the ADD-ON card and looped onto the next ADD-ON card via the dark green arrow.

  The ADD-ON card injects up to 32 channels into the large brown arrow.

  An ADD-ON card will also actively loop extra processed channels into the next ADD-ON card, and finally into the master card.

- The cross looping of the original design is now a straight loop.
- The quad speed bus can also work in one direction.

  You can use a Quad Speed audio bus to de-embed audio from the master and present on the ADD-ON card as AES/EBU, Bitstream (like Dolby) or analog audio.

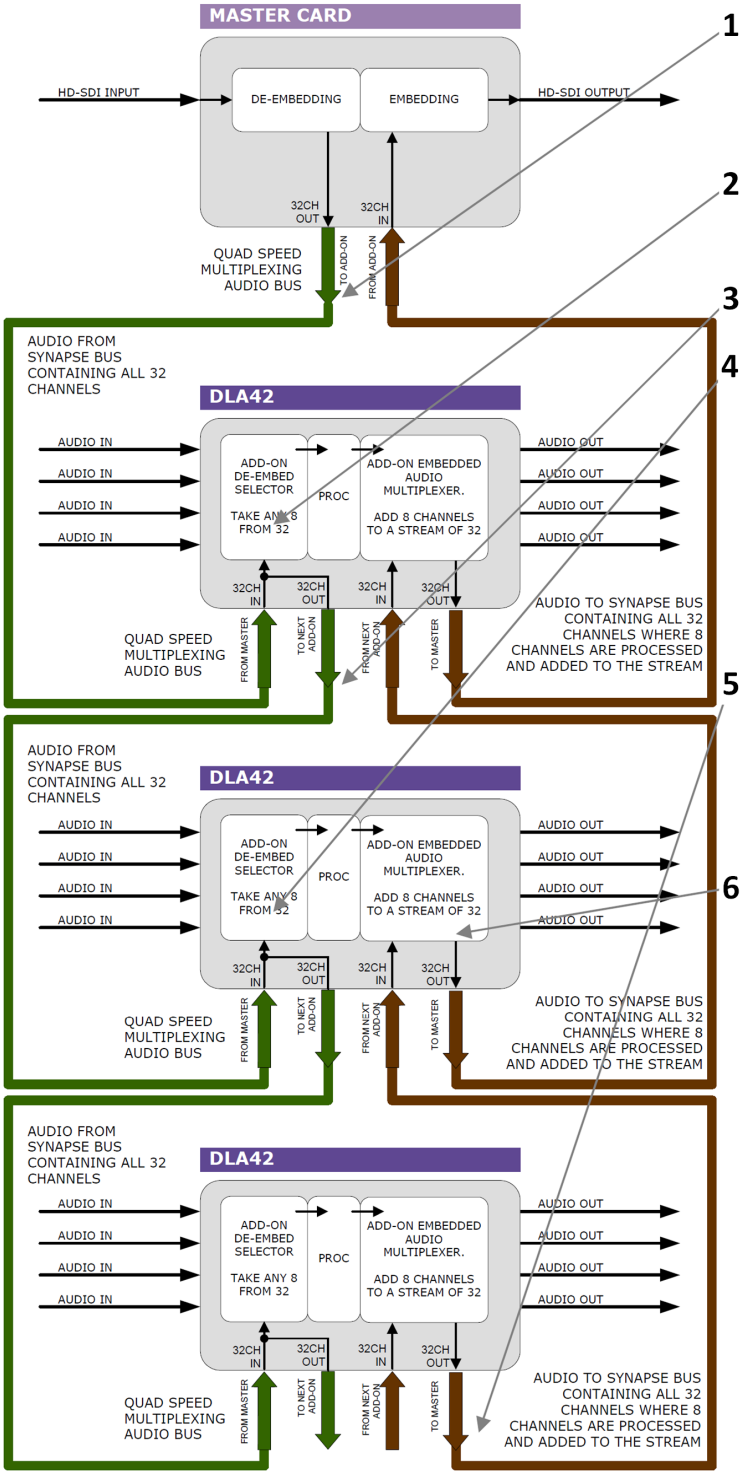
  If applicable, the ADD-ON card can also be used as in injection point of physical audio streams.

Example

The major difference between the new and old bus structure is the fact that it carries 4 times as many audio channels.

It is also bi-directional by design. So half of the original physical infrastructure moves audio from the master card to the ADD-ON cards, and the other half is used to put the audio back.

The following graphic shows how a typical quad speed bus chain works:



1. The audio from the master card (dark green arrow) contains up to 32 channels.
2. The first ADD-ON card can select any of the 32 channels for internal processing.
3. These channels are looped on to the next ADD-ON card.
4. The next ADD-ON card (sitting in the next n+1 slot) can also freely select any 8 from 32 channels. (The DLA42 can also take 3 channels from the ADD-ON bus and 5 channels from its physical input).

   This looping works up to 3 times.

5. The brown arrow is the return path and sends the (processed) audio back to the master card.

   This path is 32 channels wide and is clocked from the master card.

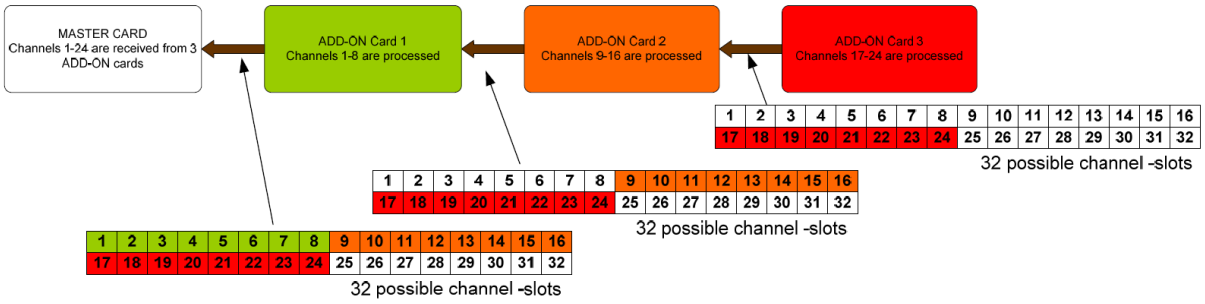
6. The ADD-ON card can for instance overwrite 8 of the 32 channels. These 32 channels are then transported to the next ADD-ON card, which overwrites another 8 channels.

Multiplexing

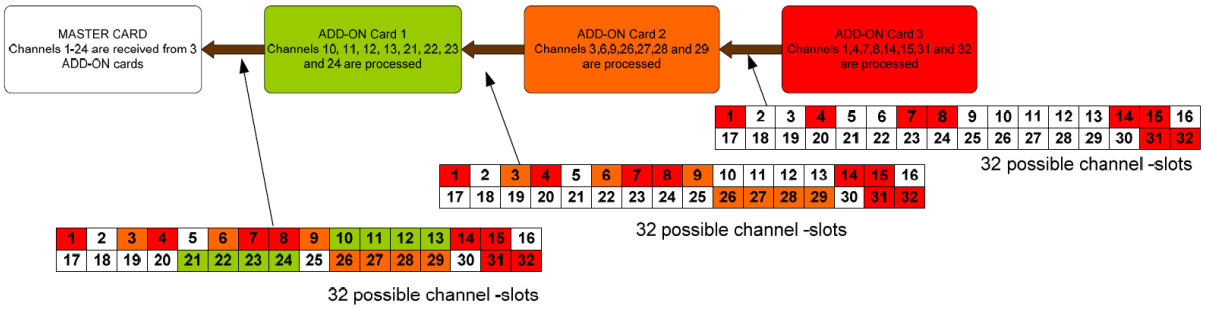
The injection of processed audio into the master card works differently to how you have been used to with the original audio ADD-ON bus. The large brown arrow will always carry 32 channels from ADD-ON to ADD-ON, or from ADD-ON to master card. Which actual channels are used or not is determined in the ADD-ON card.

In the example below, you can see a 4-Card system, with 1 master card and 3 Quad speed ADD-ON cards (the maximum). The last ADD-ON card (far right) processes 8 channels. They are inserted (a menu selection) in slots 17-24 from 32 channel slots. The second ADD-ON card also processes 8 channels, but they are inserted in slots 9-16 (of 32 slots). The first ADD-ON card inserts channels 1 to 8.

This method allows for overwriting slots that come from the right-hand master card. Channel-slots 25 to 32 are left empty in this example.



The above example shows a logical way of how the ADD-ON multiplexing could be performed. However, the insertion menu of for instance the DLA42 is much more flexible and enables any channel to be assigned to any of the 32 channel slots. The example below shows how this flexibility could be used.



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