Synapse

SCV12

High-end 12 bit SDI to composite/component/RGB encoder with Frame synchronizer and de-embedding capability

AXON Digital Design

Synapse

TECHNICAL MANUAL

SCV12

High-end 12 bit SDI to composite/component/RGB encoder with Frame synchronizer and de-embedding capability

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WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRICAL SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE

● ALWAYS disconnect your entire system from the AC mains before cleaning any component. The product frame (SFR18 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 Axon distributor.
● NEVER expose this product to extremely high or low temperatures.
● NEVER operate this product in an explosive atmosphere.

Warranty: Axon warrants their products according to the warranty policy as described in the general terms. That means that Axon Digital Design BV can only warrant the products as long as the serial numbers are not removed.

Date created: 11-03-08
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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

Axon Digital Design SCV12

FC 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.

Table of Contents

1 Introduction to Synapse

An Introduction to Synapse

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 AXON Digital Design Website at www.axon.tv 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 the Synapse device being controlled. The local control panel is also used as the input device for uploading (backing-up) and restoring card settings. Please refer to the RRC18, RRC10, RRC04, RRS04 and RRS18 manuals for a detailed description of the local control panel and the way to set-up a remote by IP and for frame related settings and readings.

Remote Control Capabilities

The remote control options are explained in the rack controller (RRC18/RRC10/RRC04/RRS04/RRS18) manual. The method of connection to a computer using Ethernet is described in the RRC manual.

! **CHECK-OUT:** "SYNAPSE CORTEX" SOFTWARE WILL INCREASE SYSTEM FLEXIBILITY OF ONE OR MORE SYNAPSE FRAMES

Although not required to use Cortex with a 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 Axon 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 from components mounted on the board.

Locating the card

The Synapse card can be placed vertically in an SFR18 frame or horizontally in an SFR04 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 card is essential as a card that is not located properly may show valid indicators, but does not function correctly.

REMARK: On power up all LEDs will light for a few seconds, this is the time it takes to initialise the card.

3 A Quick Start

When Powering-up

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

Default settings

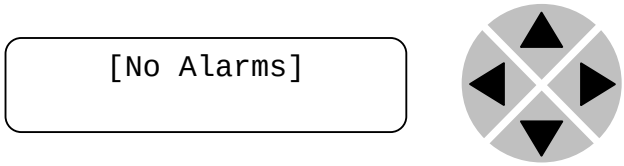
By default the SCV12 functions as a 4 channel SDI distribution amplifier, with 4 down converted CVBS (composite) outputs. By default channels 1 till 8 of the embedded audio of the input are de-embedded to the synapse bus.

Changing settings and parameters

The front panel controls or Cortex can be used to change settings. An overview of the settings can be found in chapter 5, 6 and 7 of this manual.

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.

Press ►	To go forward through the menu structure.
Press ◄	To go back through the menu structure.
Press ▲	To move up within a menu or increase the value of a parameter.
Press ▼	To move down through a menu or decrease the value of a parameter.

REMARK: In the settings menu, pressing ► twice will reset the value to its default

Example of changing parameters using front panel control

With the display as shown below

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

Pressing the ► 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 eg `Status, Events`)

The display changes to indicate that the SFS10 `Settings` menu item `SDI-Format` has been selected and shows that it 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, eg `Mode, H-Delay`)

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

```
SFS10 [Edit
Setting]
```

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.

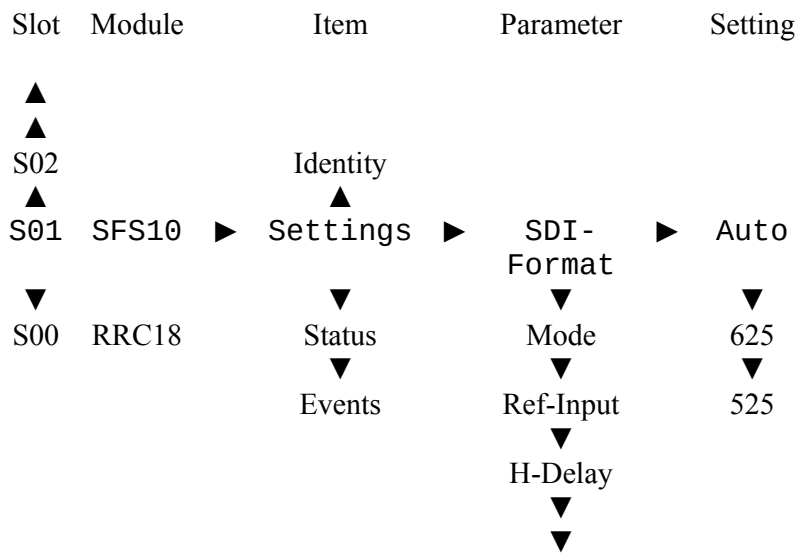
Cortex software

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 instructions and operation of Cortex, please refer to the Cortex help files.

Menu Structure Example



REMARK: Further information about Front Panel Control and can be obtained from the RRC18, RRC04, RRS18 and RRS04 operational manuals.

4 The SCV12 Card

Introduction

The SCV12 is an SDI to Composite or Component or RGB converter with frame synchronizer or video delay and video proc-amp. The encoder has a very flexible timing circuit that allows for multiple output phase options. In addition, it has an 8 channel de-embedding function in combination with 1 or 2 ADD-ON cards. The synchronizer function can be used to synchronize a non-synchronous signal or to compensate a delay. The unit has four composite outputs in CVBS mode. The black & burst reference is connected through the central gen-lock input of the SFR18, SFR08 or SFR04.

Features

Following features are included in the SCV12:

- 12 bit encoding
- 4 reclocked SDI and 4 composite video outputs
- Frame synchronizer (not for SD-SDI reclocked outputs)
- Fully adjustable output delay up to 1 frame (with respect to the SDI input or B&B reference in 1/16 pixel increments)
- Adjustable Sub-H phase or sub carrier reference phase in between -89 and 89 degrees
- Colorbar generation adjustable for 100%, 75%
- Auto detecting of format (525/625)with correct reference input selection (SFR18 only)
- Vertical interval blanking
- Selectable NTSC setup
- Proc-amp
- EDH detection
- Selectable panic freeze or manual freeze
- 2 Group de-embedder in combination with DAC24, DAC20 or DAS24
- Compatible with fiber I/O panels

5 Settings Menu

Introduction

The settings menu displays the current state of each setting within the SCV12 and enables the item to be changed or adjusted.

Settings can be changed using the front panel of the Synapse frame (SFR18 or SFR04) or Cortex software.

Please refer to chapter 3 for information on the Synapse front panel control and Cortex.

Sources

The SCV12 accepts an SDI Input, additionally it is capable of generating internal test patterns. `Sources` select between the `SDI` input and the choice of 2 test patterns, `Colorbar75` (75% Color Bars) and `Colorbar100` (100% Color Bars). The default setting is `SDI`.

Format

This item controls the detection of the input format and the mode of the internal test signal generator. The settings of `Format` are `Auto` detection, `625`, `525`.

The default setting is `Auto`.

LockMode

`LockMode` determines the mode by which the SCV12 is locked to the video stream. The settings of `LockMode` are `Ref_1`, `Ref_2`. `Auto-Ref`, `SDI-Lock`. Is Ref 1 or 2 are selected the card is locked to the Black&Burst signal that is connected to the SFR18/04 central input. SDI-Lock means that the timing is derived from the SDI signal and the composite output is in phase with this signal. Set to auto-ref the card automatically locks to either Ref 1 or ref 2, depending on where it finds a valid reference.

The default setting is `SDI-Lock`.

Output

This sets the output format of the analog video outputs. Can be `Composite`, `Y_Pr_Pb` or `RGB`. By default it is set to `Composite`.

Standard

This sets the output standard of the analog video outputs. Can be set to `NTSC`, `PAL_BGHID`, `PAL_M` or `PAL_N`. Can also be set to `Auto`, which sets the card to select a standard automatically. By default, the setting `NTSC` is used.

Freeze

`Freeze` enables the capture of one Video Field or Frame (depending on the setting of `Frz-Mode`). The settings of Freeze are `On` or `Off`.

The default setting is `Off`.

Panic-Frz

`Panic-Frz` enables the capture of the last video information when the input signal is lost. Panic freeze always uses Field mode irrespective of the settings of the `Freeze-mode` menu item. The settings of `Panic-Frz` are `On` or `Off`.

The default setting is input `Off`.

Frz-Mode

`Frz-mode` gives the choice of storing a complete Video Frame or Field (double written) for the above `Freeze` Menu and the external freeze input.

The default setting is `Field`.

Pedestal

Sets the pedestal (or setup) of the video signal to a defined level. Can set according to `On` or `Off`. The default setting for `Pedestal` is `Off`.

Halfline

In order to maintain the half line necessary for PAL interlacing, `Halfline` enables line 23 to be active or to have the first half of the line blanked. The settings for `Halfline On` or `Off.` The default setting of `Halfline` is `Off`.

V-Blanking

`V-Blanking` determines if you blank the Vertical interval (line 6 until line 23) or not.

The default setting of `V-Blanking` is `Off`.

EDH-Det

This setting allows the user to choose between Active-Picture (`Active-P`) or Full-Field (`Full-F`) EDH detection.

Luma-filter

`Luma-Filter` allows the selection of filters with different characteristics that can be used to enhance Luminance performance. `Luma-Filter` can be set to `LPF_NTSC`, `LPF_PAL`, `Notch_NTSC`, `Notch_PAL`, `SSAF`, `CIF` and `QCIF`. The filter can also be set to `Auto`, which sets the Luma filter automatically.

Some technical specifications of some of the settings:

- SSAF has a frequency response of -3dB at 6,45Mhz and -80dB at 8Mhz and a pass band ripple of 0,04
- CIF has a frequency response of -3dB at 3.02 Mhz and pass band ripple 0,127 , low pass filter
- QCIF has a frequency response of -3dB at 1,5 Mhz and pass band ripple Monotonic, low pass filter

The default setting is `LPF_NTSC`.

Chroma-filter

The `Chroma-Filter` setting adjusts the bandwidth of the chroma channel. Selection is made between `0.65Mhz`, `1.0Mhz`, `1.3Mhz`, `2.0Mhz`, `3.0Mhz`, `QIF` and `QCIF`.

Some technical details about some of the settings:

- CIF has a frequency response of -3dB at 0,65 Mhz and pass band ripple Monotonic, low pass filter
- QCIF has a frequency responcy met -3dB at 0,5 Mhz and pass band ripple Monotonic, low pass filter

The default setting is `3.0Mhz`.

H-Delay

The H-Delay setting allows adjustment of the horizontal phase of the output signal with respect to the selected reference input.

The H-Delay setting gives a delay in addition to the reference timing. For example, if H-Delay is set to 10 samples, the output signal will be delayed by the reference timing + 10 samples of 37ns, therefore the delay = Ref timing+ 37ns x10. The signal is delayed (advanced) with respect to the phase of the reference signal.

In 625/50 the adjustment range of H-Delay is 0-1727 samples, 0..64 µs (one PAL TV line).

In 525/60 the adjustment range of H-Delay is 0-1715 samples, 0…63.556 µs (one NTSC TV line).

The default setting is 0 samples. The delay of the card is indicated by the tracking pulse on the BNC output. This can be used, for example, to track an audio delay.

V-Delay

V-Delay setting allows adjustment of the vertical phase of the output signal with respect to the selected reference input.

The V-Delay setting gives a delay in addition to the reference timing. For example, if V-Delay is set to 10 TV lines, the output signal will be delayed by the reference timing + 10 TV lines. The signal is delayed (advanced) with respect to the phase of the reference signal.

In 625/50 the adjustment range of V-Delay is 0-624 lines (one TV frame).

In 525/60 the adjustment range is 0-524 lines (one TV frame).

The default setting is 0 lines.

The delay of the card is indicated by the tracking pulse on the BNC output. This can be used, for example, to track an audio delay.

ScH-Phase

The ScH Phase of the PAL output can be set using `ScH-Phase`. `ScH-Phase` has a range of `–89` degrees to `89` degrees in steps of 1 degree. The reference point for ScH Phase is Line 1 of Field 1. The default setting of `ScH-Phase` is `0` degrees.

Hue

The setting `hue` adjusts the position of the wavelength in degrees. The available setting range is from `–22` to `22` degrees in steps of 1 degree.

The default setting is `0` degrees.

Y-Gain

`Y-Gain` adjusts the Y component of the composite output. `Y-Gain` has an adjustment range of `0%` to `199.8%`. The default setting of `Y-Gain` is `100%`.

Cr-Gain

`Cr-Gain` adjusts the Cr component of the composite output. `Cr-Gain` has an adjustment range of `0%` to `199.8%`. The default setting of `Cr-Gain` is `100%`.

Cb-Gain

`Cb-Gain` adjusts the Cb component of the composite output. `Cb-Gain` has an adjustment range of `0%` to `199.8%`. The default setting of `Cb-Gain` is `100%`.

R-Gain

`R-Gain` adjusts the level of the R component in a range of `0%` to `199.8%`.

The default setting is `100%`

G-Gain

G-Gain adjusts the level of the G component in a range of 0% to 199.8%.

The default setting is 100%

B-Gain

B-Gain adjusts the level of the B component a range of 0% to 199.8%.

The default setting is 100%

R-Black

R-Black adjusts the black level of the R component in a range from -128 bit to 127 bit.

The default setting is 0 bit.

G-Black

G-Black adjusts the black level of the G component in a range from -128 bit to 127 bit.

The default setting is 0 bit.

B-Black

B-Black adjusts the black level of the B component in a range from -128 bit to 127 bit

The default setting is 0 bit.

Black

Black controls the total R-G-B Black gain in a range from

-128 bit to 127 bit.

The default setting of Black is 0 bits.

Dem-sel A1 ~ Dem-sel A4

The SCV12 has an eight channel de-embedder. The Synapse bus outputs 1 to 8 can contain one out of the 16 possible audio channels available in the SDI domain (Ch_1 till Ch_16). De-embedder A outputs 4 channels to the first AddOn output group.

Default for Dem-sel A1 ~ Dem-sel A4 are respectively Ch_1 to Ch_4.

Dem-sel B1 ~ Dem-sel B4

The SCV12 has an eight channel de-embedder. The Synapse bus outputs 1 to 8 can contain one out of the 16 possible audio channels available in the SDI domain (Ch_1 till Ch_16). De-embedder B outputs 4 channels to the second AddOn output group. Default for Dem-sel B1 ~ Dem-sel B4 are respectively Ch_5 to Ch_8.

6 Status Menu

Introduction

The status menu indicates the current status of each item listed below.

SDI-Input

This status item indicates if a valid serial digital video signal is present at the input. `SDI-Input` indicates if an input signal is `NA` (not available) or `Present`.

Ref-Input

This status item recognises a valid reference input on the chosen reference input. Status is not feedback when there is no input. `Reference` indicates if a reference input is `NA` (not available) or `Present`.

Format-Det

`625-Lines` and `525-Lines` standards can be detected as the valid input signal format, 625/50 and 525/60 are recognised as valid inputs.

GrpInUse

`GrpInUse` indicates the audio groups that are already present in the incoming SDI signal. The indication of a group, or groups being present is as follows,

Display

```
____
1___
_2__
12__
__3_
1_3_
_23_
123_
___4
1__4
_2_4
12_4
__34
1_34
_234
1234
```

When no groups are present `GrpInUse` indicates _____.

Add_on A1 ~ Add_on B4

This item indicates the status of the audio, which is present in addon A1 till addon B4. `OK` indicates that the audio channels are present, `NA` indicates the audio is not available.

ANC-stat

`ANC-stat`, Ancillary Status, indicates that embedded audio is present and valid. `ANC-stat` indicates if an input signal is `OK`, `NA` (not available) or `Error`.

EDH- Stat

`EDH-Stat`, indicates the status of the EDH within the incoming SDI `signal. OK` is indicated if the status of the detected EDH does not indicate errors.

`UES` is shown if an EDH data block is not present.

`EDA` is displayed if an EDH error has previously been detected by another card in the SDI chain.

`EDH` is displayed if a previously undetected EDH error is detected by this device.

FILT-Stat

This status item displays the current active status of the Luma-filter setting. Can be one of the following statuses:
- LPF_NTSC
- LPF_PAL
- Notch_NTSC
- Notch_PAL
- SSAF
- CIF
- QCIF

Standard-Stat

This status item displays the current active status of the Standard setting. Can be one of the following statuses:
- NTSC
- PAL_BGHID
- PAL_M
- PAL_N

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.

SCV12 Events

The events reported by the SCV12 are as follows;

Announcements

Announcements is not an event. This item is only used for switching the announcement of status changes on/off. 0=off, other =on

Input

Input can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting.

Reference

Reference can be selected between 0 .. 255. 0= no event, 1..255 are the priority setting. If the reference is lost an Event will be generated at the priority.

EDH status

EDH status can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting.

ANC status

ANC status 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;

1) A message string to show what has happened in text, for example: “INP_LOSS”, “REF_LOSS”, “INP_RETURN”.
2) 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 see the table on the next page.
3) 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.
4) A slot number of the source of this event.

The 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.

The Tag

The tag is also defined in the card. The tag has a fixed meaning. When controlling or monitoring software should 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 fault status (e.g. 1 for Loss of Input) the complement is marked by the tag increased by 128 (80_{hex}) (e.g. 129 (81_{hex}) for Return of Input).

Defining Tags

The tags defined for the SCV12 are:

Event Menu Item	Tag		Description
Announcements	0 or NA	0 or NA	Announcing of report and control values
Input	01_{hex}=INP_LOSS	81_{hex}=INP_RETURN	primary input lost or returned
Reference	02_{hex}=REF_LOSS	82_{hex}=REF_RETURN	reference lost or returned
EDH-Status	03_{hex}=EDH_ERROR	83_{hex}=EDH_OK	EDH error occurred
ANC-Status	04_{hex}=ANC_ERROR	84_{hex}=ANC_OK	ANC status error

The Priority

The priority is a user-defined value. The priority is set as the value of the event-object in the card. Any nonzero value will enable the announcement of the related event. The value itself may be used to filter events at the client. The definition of that filter is completely free to the user. The client could, for instance, only show events with priority between 20 and 30, while another client display all events with priority at least 50.

The 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

Error LED

The error LED indicates an error if the internal logic of the SCV12 card is not configured correctly or has a hardware failure.

Input LED

This LED indicated the presence of a valid SDI video signal on the input.

Reference LED

This LED indicated the presence of a valid reference signal.

ANC Data LED

Indicates the presence of embedded audio within the SDI input signal.

Data Error LED

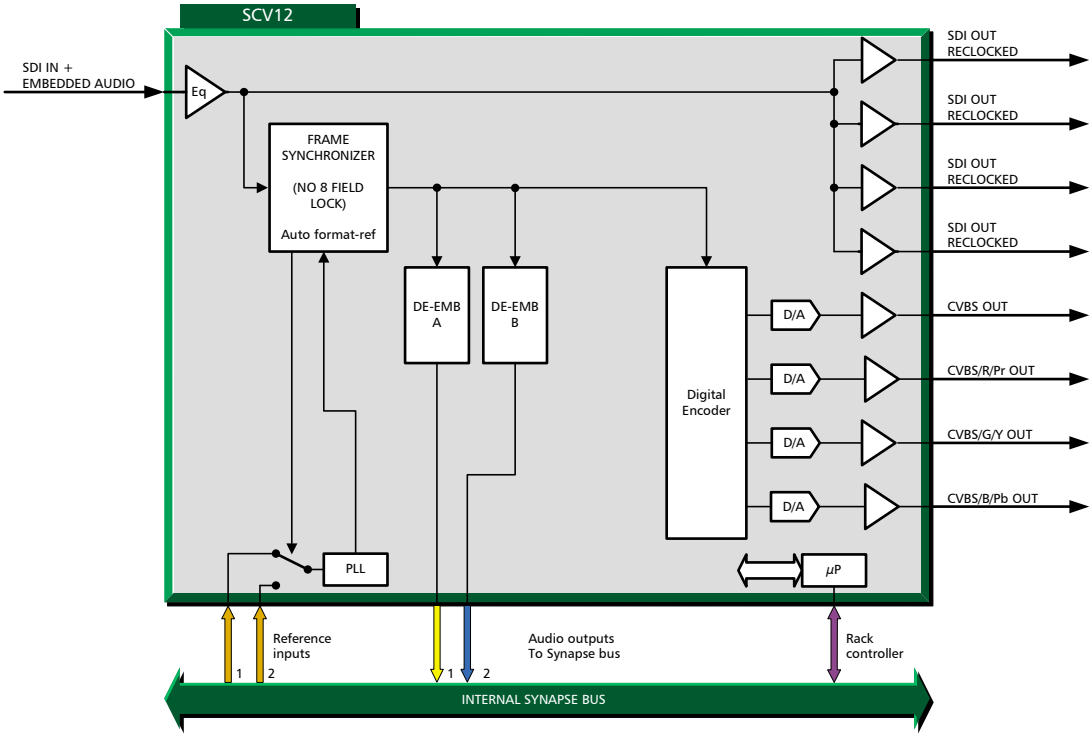
This LED indicate two different types of error:

- ANC (embedded audio) checksum error.
- EDH error

Connection LED

This LED illuminates after the card has initialised. The LED lights for 0.5 seconds every time a connection is made to the card.

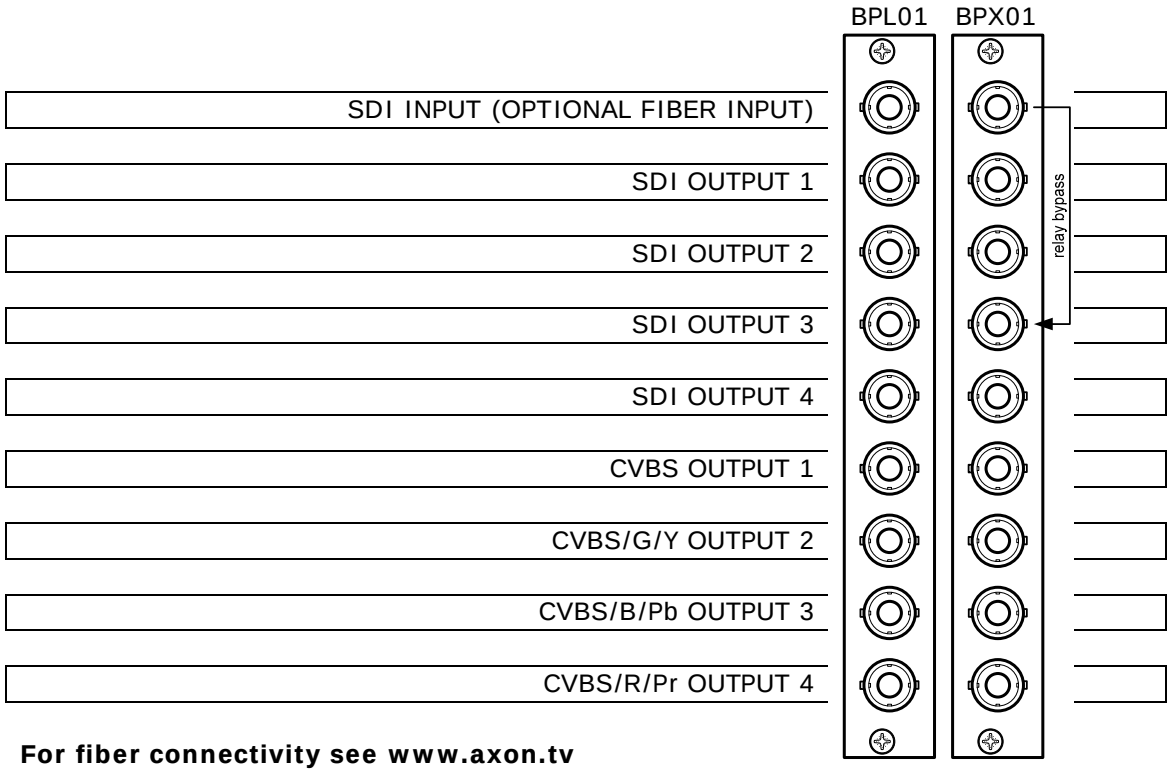
9 Block Schematic



10 Connector Panel

The SCV12 can be used with the following backplane: BPL01, BPX01

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



For fiber connectivity see www.axon.tv