

Synapse

2IX08

Dual channel integrity checking probe
with switch over function



Synapse

**TECHNICAL MANUAL
2IX08**

® AXON

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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.

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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.



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

Axon Digital Design 2IX08



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

Chapter 1	Introduction to Synapse An introduction to Synapse Local Control Panel Remote Control Capabilities
Chapter 2	Unpacking and Placement Unpacking Placing the card
Chapter 3	A Quick Start When powering-up Default settings Changing parameters and settings Front Panel Control Example of changing parameter using Front Panel control Synapse Setup Software Menu Structure Example
Chapter 4	The 2IX08 card Introduction Key Features
Chapter 5	Settings Menu
Chapter 6	Status Menu
Chapter 7	Events Menu
Chapter 8	LED Indication
Chapter 9	Block Schematic
Chapter 10	Connector panel

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 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 and RRC04 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) manual. The method of connection to a computer using Ethernet is described in the RRC/RRS manual.



CHECK-OUT: “AXON CORTEX” SOFTWARE WILL INCREASE SYSTEM FLEXIBILITY OF ONE OR MORE SYNAPSE FRAMES

Although not required to use Cortex with a Synapse frame, you are strongly advised to use a remote personal computer or laptop PC with Axon 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.

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 card is essential as a card that is not located properly may show valid indicators, but does not function correctly.

NOTE: On power up all LED's 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 LED's will light during this process. After initialisation, several LED's will remain lit – the exact number and configuration is dependant upon the number of inputs connected and the status of the inputs.

Default settings

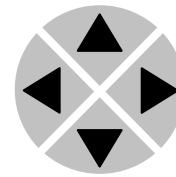
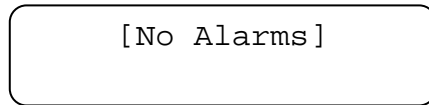
In its default condition the 2IX08 acts as a back-up switcher with only the carrier detector active.

Changing settings and parameters

The front panel controls or Axon 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.

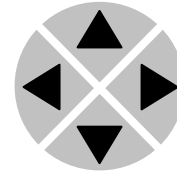
- Press ► To go forward through the menu structure.
- Press ◀ To go back through the menu structure.
- Press ▲ To move up within a menu or increase the value of a parameter.
- Press ▼ To move down through a menu or decrease the value of a parameter.

NOTE: Whilst editing a setting, pressing ► twice will reset the value to its default.

Example of changing parameters using front panel control

With the display as shown below

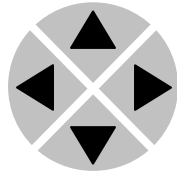
```
RRC18 [Select Card]
>S01=SFS10
```



Pressing the ► selects the SFS10 in frame slot 01.

The display changes to indicate that the 2IX08 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 its current setting is Auto.

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

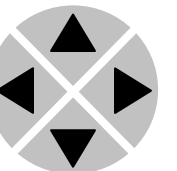


Pressing the ► selects the settings item shown, in this example SDI-Format.

(Pressing ▲ or ▼ will change to a different setting, eg 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.

Axon Cortex Software

Axon 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. Axon 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 Axon Cortex, please refer to the Cortex help files.

Menu Structure Example

Slot	Module	Item	Parameter	Setting
▲				
▲				
S02		Identity		
▲		▲		
S01	SFS10	▶ Set-tings	▶ Standard_dig	▶ Auto
▼		▼	▼	▼
S00	RRC18	Status	Mode	625
		▼	▼	▼
		Events	Ref-Input	525
			▼	
			H-Delay	
			▼	
			▼	

NOTE: Further information about Front Panel Control and Synapse Cortex can be obtained from the RRC and RRS operational manuals and the Cortex help files.

4 The 2IX08 Card

Introduction	The 2IX08 is a dual channel high performance SDI video and embedded audio probe (signal integrity monitor) with clean switch-over function. The difference between the 2IX10 and 2IX08 is that the latter has an enhanced range of probing functions that include phase reversal and macro blocking detection. And in the 2IX08 is no frame-sync available. The switch function can be triggered by any of the monitored parameters or by GPI. Besides these extensive functions, the card also provides full line and frame synchronization on both inputs. Each output has a fan-out amplifier and all outputs can be sourced by the same output.
Three Serial Digital Outputs	Three processed digital outputs are available for each input.
Automatic Standard Selection	Both SDI inputs channels have Automatic standard selection. 625 and 525 are the standards that are recognized.
Back planes	BPL11 or BPX04 are the available backplanes for the 2IX08. The available Fiber backplanes are: BPL11T2_FC/PC,BPL11T2_SC, BPL11R2_FC/PC, BPL11R2_SC
Miscellaneous	The 2IX08 cards fit into the Axon SFR04 & SFR18 racks. LED's at the front of the board indicate the presence of an input signal and connection & processor Errors. The 2IX08 can be controlled by Axon Synapse Set-Up Software.
A and B input	The software is represented the inputs as A and B. A is for input_1, B is for input_2.

5 Settings Menu

Introduction

The settings menu displays the current state of each setting within the 2IX08 and enables the item to be changed or adjusted.

Settings can be changed using the front panel of the Synapse frame (SFR18, SFR08 or SFR04) or Cortex.

Format

The setting `Format` determines the video format, 625 for 625 lines/50 Hertz, 525 for 525 lines/60 Hertz.

The default setting is 625.

Output-Config

`Output-Config 2x2` configures the output A as input 1 to output 1, 2 and 3 and input 2 to output 4, 5 and 6.

`Output-Config 2x1` configures the selected input to all the 6 outputs.

`Output-Config Combined` configures the I/O routing in the same way as 2x2 in normal mode, but can be switched to a 2x1 or 2x2 mode when signal integrity is not OK. ***Please read appendix 1 for further details about this setting.***

The default setting is 2x1

Input-Sel

`Input-Sel` determines which inputs are selected.

- **AUTO mode:** the card acts as a backup-switcher, and all kind of integrity checks can be set as criteria to switch to the other channel.
- **GPI-only:** allows you to switch between channel A and B with GPI contacts.
- **INPUT A:** manual selection of input A.
- **INPUT B:** manual selection of input B.
- **Auto-GPI:** combines the auto and the GPI function for automatic overwrite of the GPI function (default)
- **GPI-Auto:** GPI output functionality for manual overwrite of the auto backup function. Works like displayed in the following table:

GPI1	GPI2	OUT A	OUT B
Open	Open	Auto	Auto
Ground	Open	inA	inA
Open	Ground	inB	inB
Ground	Ground	inB	inA

Note: Auto-GPI gives error detection priority over the GPI selection, while GPI-Auto gives priority to GPI over error detection.

Switch-Back	<p>Switch-Back can be set On or Off.</p> <p>When Switch-Back is set to On, and a change over to channel 2 has occurred, the card will immediately switch back to channel 1 when channel 1 is OK again.</p> <p>When Switch-Back is set to Off, and a change over to channel 2 has occurred. In this state the card will always stay on channel 2.</p> <p>When Switch-Back is set to BackUp_Fail, channels only switch when input B has an error and input A is OK.</p> <p>The default setting is Off.</p>
Carrier-Det	<p>Carrier-Det allows the card to detect a SDI carrier.</p> <p>Off: the functionality is switched OFF.</p> <p>Probe: the card will detect a loss of carriers, but will only give this as a status item. The card will not switch to the other channel.</p> <p>Carrier A, B and A+B: the card will detect a loss of carrier on the selected channel and switch to the other channel.</p> <p>The default setting is A+B.</p>
TRS-Error-Det	<p>TRS-Error-Det allows the card to detect if the amount set with TRS-threshold. A normal SDI signal contains 512 TRS.</p> <p>TRS= Timing Reference Signal.</p> <p>Probe: the card will detect if the amount of TRS is to low, but will only give this as a status item. The card will not switch to the other channel.</p> <p>TRS A, B and A+B: the card will detect a loss of TRS on the selected channel and switch to the other channel.</p> <p>The default setting is A+B.</p>
EDH-DET	<p>EDH-Det will set to card to detect if the input signal contains any of the possible EDH alarms. It is possible to set the EDH-Type to monitor over either the FULL picture or the Active picture using the next setting.</p> <p>Off: the functionality is switched OFF.</p> <p>Probe: the card will detect an EDH error, but will only give this as a status item. The card will not switch to the other channel.</p> <p>EDH: A, B and A+B the card will detect an EDH alarm on the selected channel and switch to the other channel.</p> <p>The default setting is Off.</p>

EDH-Type	EDH-Type determines whether the EDH is monitored over the FULL-F or the Active picture. In case of FULL-F, the vertical and horizontal blank interval is also included.
	The default setting is <code>Active -P</code> .
GPI-mode	GPI-Mode can be set to <code>Mode-1_Latching</code> or <code>Mode-1_Non-Latch</code> or <code>Mode-2</code> . <code>Non-Latching</code> when a contact is closed all the time <code>Latching</code> when a contact is closed momentarily. <code>Mode-2</code> works with GPI pulses, tapping GPI1 will select input 1, tapping GPI2 will select input 2.
	The default setting of <code>GPI_Mode</code> is <code>Mode-1_Non-Latch</code> .
Carrier-Gen	When this setting is set to <code>ON</code> and the selected input is lost, an empty carrier will be set as output. When set to <code>OFF</code> and the selected input is lost, no carrier will be generated at all. Default is <code>ON</code> .
Trs_Threshold	This sets the threshold for the <code>TRS-Error-Det</code> setting. Until this threshold isn't reached in amount of TRS errors, the card won't detect it as an alarm. Can be set between 6 and 512 errors. Default is 8 errors.
Monchr-Det	This setting allows the card to detect if the input is monochrome. <i>Probe:</i> the card will detect if the input is monochrome, but will only give this as a status item. The card will not switch to the other channel.
	<i>A, B and A+B:</i> the card will detect a monochrome signal on the selected channel and switch to the other channel.
	The default setting is off.

6 Status Menu

Carrier	<p>Carrier detects if there is a valid 270 Mb/s signal present.</p> <p>OK if present</p> <p>A-Error: no input on input 1.</p> <p>B-Error: no input on input 2.</p> <p>AB-Error: no input on input 1 and 2.</p>
TRS	<p>TRS detects the amount of TRS in the signal, and if this reaches a certain low amount, an error is displayed.</p> <p>A-Error indicates that input 1 is producing an error</p> <p>B-Error indicates that input 2 is producing an error</p> <p>AB Error indicates that both input 1 and 2 are producing errors.</p> <p>TRS = Timing Reference Signal for more information. See SMPTE standard 259m.</p>
EDH	<p>EDH detects the state of the EDH in the inputs. All error states are displayed as an error.</p> <p>OK if no error is present</p> <p>A-Error input 1 has an EDH error</p> <p>B-Error input 2 has an EDH error</p> <p>AB-Error input 1 and 2 both have EDH errors</p>
Active-A	<p>Active-A shows which channel is being output from channel A.</p>
Active-B	<p>Active-B shows which channel is being output from channel B.</p>
Preselect	<p>This status item indicates the preselected input option (used in combine mode) when a take is triggered in the GPIs. Can be Normal, Input-A, Input-B or Swap. For details, please refer to appendix 1.</p>
Monochr	<p>Indicates if one of the inputs (or both) is monochrome.</p>

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.
Events	The events reported by the 2IX08 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
Ref-Status	Ref-Status can be selected between 0 .. 255. 0= no event, 1..255 are the priority setting. If set to 0 no events will be generated. If the reference is lost an Event will be generated at the priority.
Active_Out_A	Active_Out_A can be selected between 0 .. 255. 0= no event, 1..255 are the priority setting. If set to 0 no events will be generated. If the reference is lost an Event will be generated at the priority.
Active_Out_B	Active_Out_B can be selected between 0 .. 255. 0= no event, 1..255 are the priority setting. If set to 0 no events will be generated. If the reference is lost an Event will be generated at the priority.
Input_A	Input_A can be selected between 0 .. 255. 0= no event, 1..255 are the priority setting. If set to 0 no events will be generated. If input A is lost an Event will be generated at the priority.
Input_B	Input_B can be selected between 0 .. 255. 0= no event, 1..255 are the priority setting. If set to 0 no events will be generated. If input B is lost an Event will be generated at the priority.

EDH-Status_A	EDH-Status_A can be selected between 0 .. 255. 0= no event, 1..255 are the priority setting. If set to 0 no events will be generated. If input A has an EDH error an Event will be generated at the priority.
EDH-Status_B	EDH-Status_B can be selected between 0 .. 255. 0= no event, 1..255 are the priority setting. If set to 0 no events will be generated. If input B has an EDH error an Event will be generated at the priority.
TRS-Status_A	TRS-Status_A can be selected between 0 .. 255. 0= no event, 1..255 are the priority setting. If set to 0 no events will be generated. If input A has an TRS error an Event will be generated at the priority.
TRS-Status_B	TRS-Status_B can be selected between 0 .. 255. 0= no event, 1..255 are the priority setting. If set to 0 no events will be generated. If input B has an TRS error an Event will be generated at the priority.
What information is available in an event?	<p>The message consists of the following items;</p> <ol style="list-style-type: none"> 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 Axon Cortex 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 2IX08 are:

Event Menu Item	Tag		Description
Announcements	0 or NA	0 or NA	Announcing of report and control values
Ref-Status	02 _{hex} =REF_LOSS	82 _{hex} =REF_RETURN	reference lost or returned
Active_Out_A	19 _{hex} =IN_B_->_OUT_A	02 _{hex} =IN_A_->_OUT_A	Which input is on the output
Active_Out_B	1A _{hex} =IN_A_->_OUT_B	02 _{hex} =IN_B_->_OUT_B	Which input is on the output
Input_A	01 _{hex} =INP_LOSS	81 _{hex} =INP_RETURN	primary input lost or returned
Input_B	41 _{hex} =INP_LOSS	C1 _{hex} =INP_RETURN	primary input lost or returned
EDH status_A	03 _{hex} =EDH error	83 _{hex} =EDH ok	EDH error or OK
EDH status_B	43 _{hex} =EDH error	C3 _{hex} =EDH ok	EDH error or OK
TRS status_A	17 _{hex} =TRS error	97 _{hex} =TRS ok	TRS error or OK
TRS status_B	48 _{hex} =TRS error	C8 _{hex} =TRS ok	TRS error or OK

The Priority

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

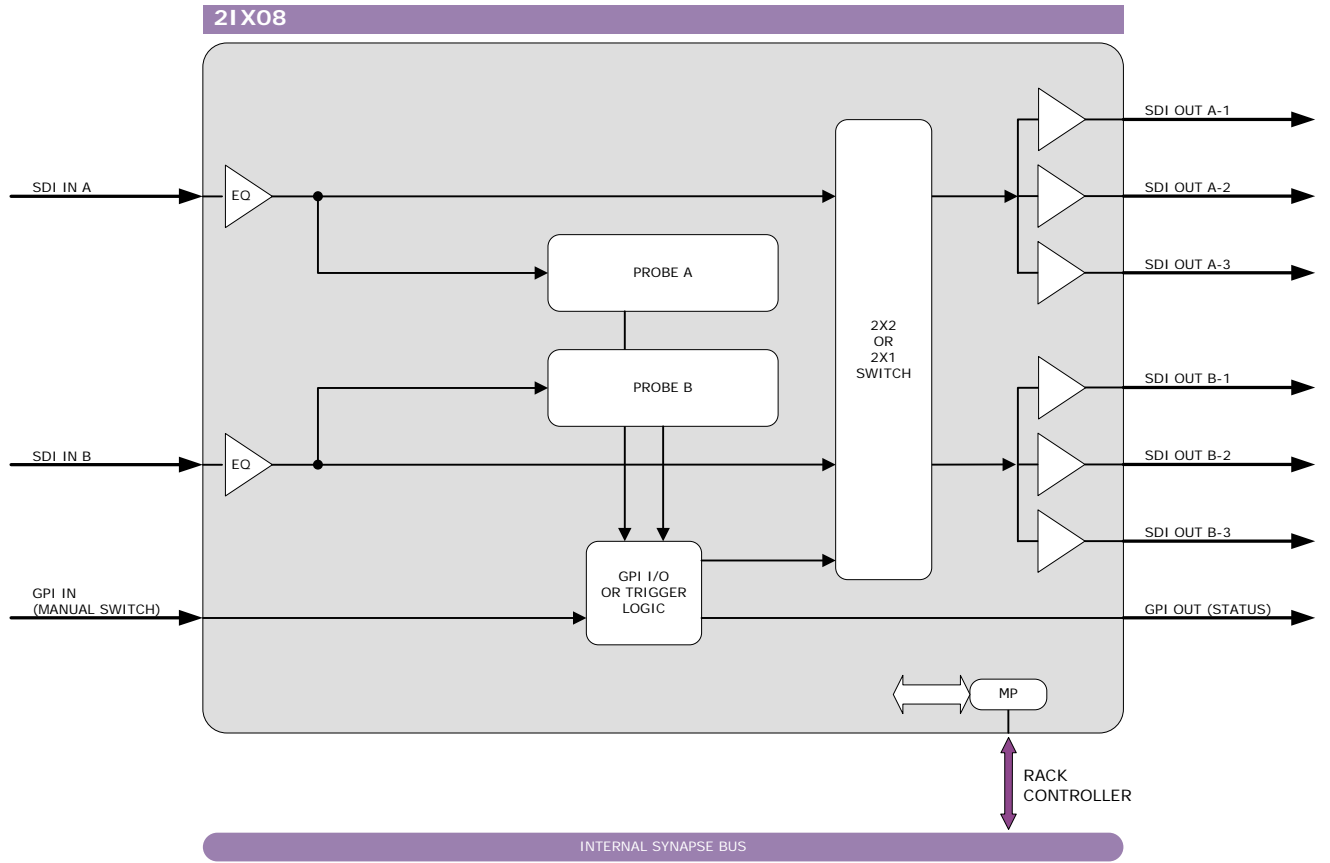
The Address

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.

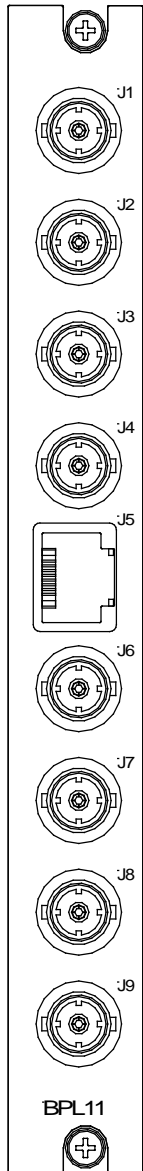
8 LED Indication

Error LED	The error LED indicates an error if the internal logic of the 2IX08 card is not configured correctly or has a hardware failure.
Input LED_A	This LED indicated the presence of a valid video signal on the input.
Input Led_B	This LED indicated the presence of a valid video signal on the input.
Reference LED	Indicated the presence of a valid reference signal on the selected reference input connector (ref-1 or ref-2). See section 5 Ref Input.
ANC Data LED	This led indicates the presence of embedded audio in the serial digital video signal.
DATA ERROR LED_A	This led indicates three different types of errors: <ul style="list-style-type: none">- Audio signal 1, 2, 3 or 4 of the local output is clipped.- ANC Error.
DATA ERROR LED_B	This led indicates three different types of errors: <ul style="list-style-type: none">- Audio signal 1, 2, 3 or 4 of the local output is clipped.- ANC 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 BPL11



J1 = SDI INPUT A

J2 = Processed SDI A out

J3 = Processed SDI A out

J4 = Processed SDI A out

J5 = GPI INPUTS

J6 = SDI INPUT B

J7 = Processed SDI B out

J8 = Processed SDI B out.

J9 = Processed SDI B out

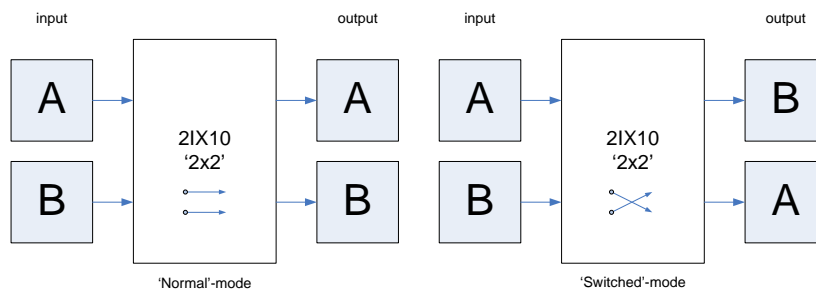
!Unused inputs and outputs must be terminated with the correct impedance!

Appendix 1 | Clarification of the 2IXxx settings (from version 1312 and up)

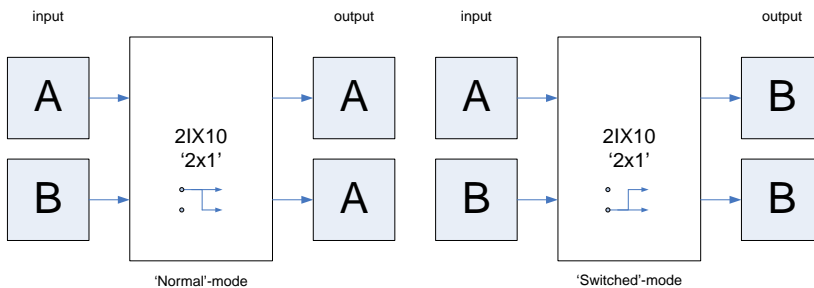
The 2IXxx has two input channels A_i and B_i and two output channels A_o and B_o . The 2IXxx has a lot of settings, which makes the card a powerful monitoring card, but with it also increasing the operating complexity. This document clarifies some of these settings, and the dependencies between them. The figures in this document refer to the 2IX10, however these are also applicable to the 2IX08 and 2IX09.

Setting 'Output-Config' [2x2, 2x1, Combined] determines output configuration.

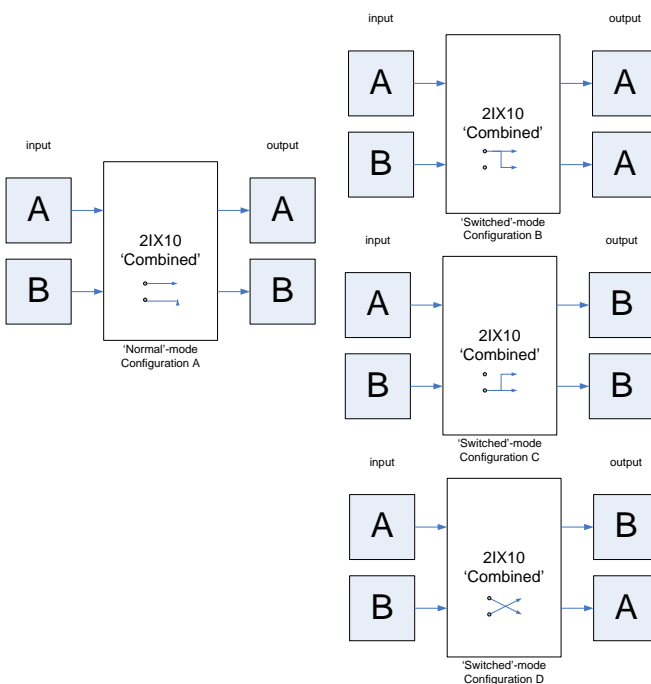
- 2x2: Outputs A_o and B_o are always different, independent on the possible error status of the input channels. 'Normal' and 'Switched'-mode are explained further on.



- 2x1: Outputs A_o and B_o are always the same.



- Combined: Outputs A_o and B_o similar to 2x2 mode but switched in 2x1 mode



Multiple monitoring functions, e.g. Carrier-Det, can be set to monitor the input channel(s), these can be set to the following options:

- Off: The functionality for this function is switched off; also the corresponding status of this setting is turned off.
- Probe: An error, for this function, is detected (for both input channels) but only given as a status-item. The card will not switch to another channel.
- A: This error checking function is turned on only for channel A. The corresponding status-item will depict the status for both channels, but switching only occurs when channel A has an error.
- B: This error checking function is turned on only for channel B. The corresponding status-item will depict the status for both channels, but switching only occurs when channel B has an error.
- A+B: This error checking function is turned on for both channels, and the corresponding status-item also depicts the status for both channels. Switching is dependent on the other settings.

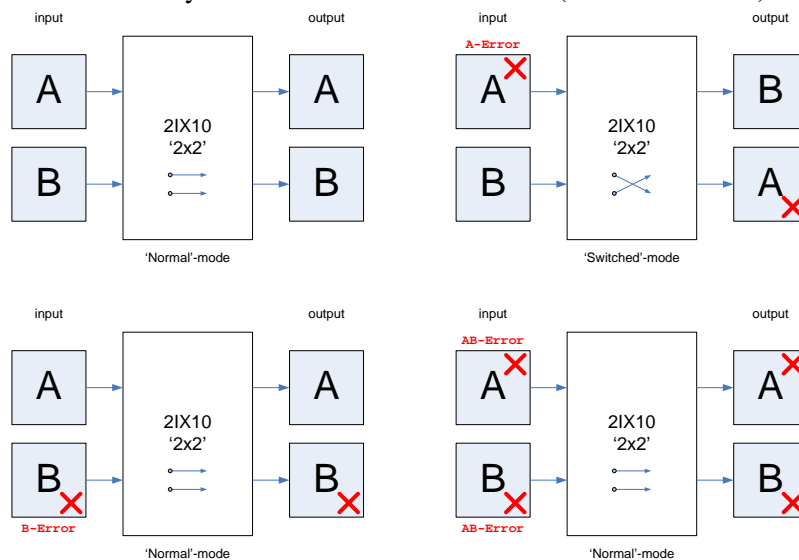
The corresponding status-items can have the following options:

- Ok: when detection is turned off, or the monitoring channels are both all right.
- A-Error: Indicates that an error is occurring on input channel A_i.
- B-Error: Indicates that an error is occurring on input channel B_i.
- AB-Error: Indicates that an error is occurring on both input channels.

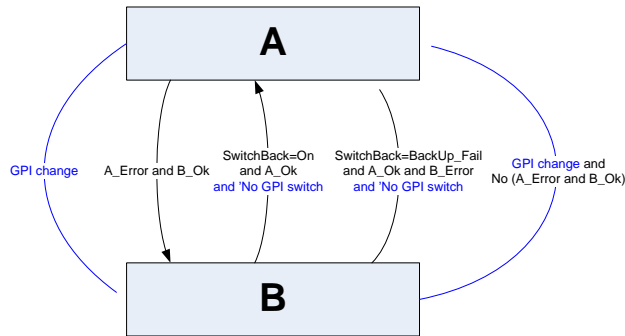
All these active functions (A, B, A+B) combined determine the error status of a channel. Subsequently, dependent on the settings: Input-Sel, Switch-Back, and possibly the GPI status, switching of the output channels can occur.

Setting 'Input-Sel' [Auto, Auto-GPI, GPI-Only, Input A, Input B] determines which input is selected. Here only the selection for output A_o is described, output B_o is then only dependent on the setting Output-Config (described above).

- Auto: Automatically selects the correct output for output A_o. Only a switch occurs when only input A_i has an error (i.e. the functions which are turned on to monitor the channels). Whether a channel switches back is determined by the Switch-Back function (described below).

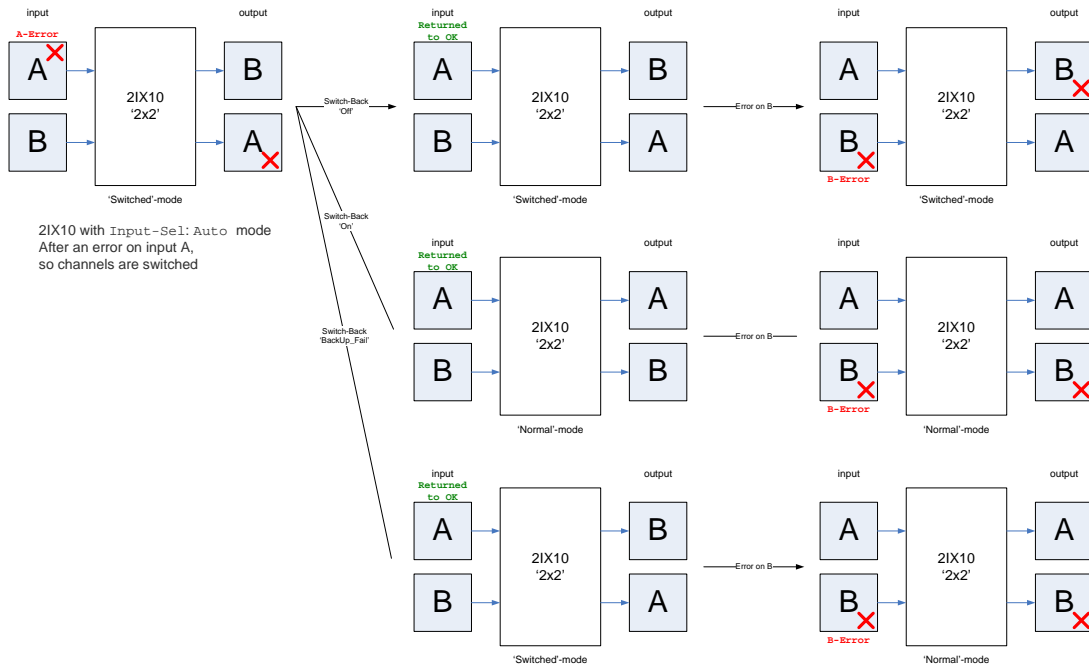


Auto-GPI: Combines the Auto and the GPI-Only mode (see figure below). Channels switch automatically when there is an error on input A_i and the status for B_i is Ok. And through a GPI change you can force a switch to select the other input channel.

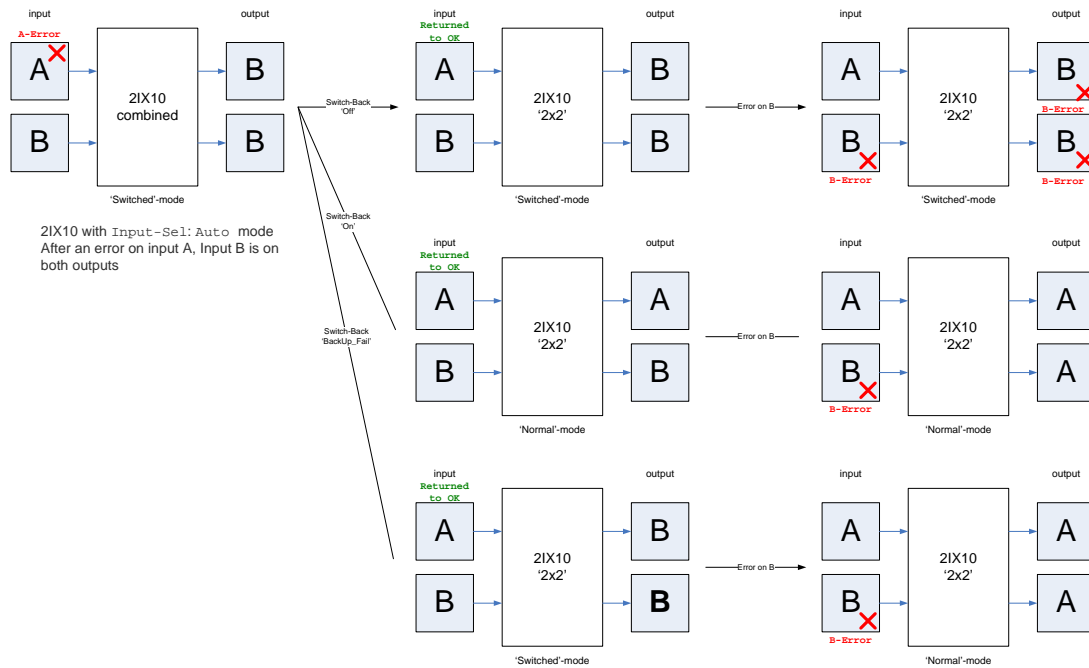


- GPI-Only: A GPI change triggers a switch to the other channel. Working GPI contacts depends on the GPI-mode [Mode-1_Non-Latch, Mode-1_Latching, Mode-2] setting (described below).
- Input A: Manual select input channel A_i , for output A_o ('Normal'-mode).
- Input B: Manual select input channel B_i , for output A_o ('Switched'-mode).

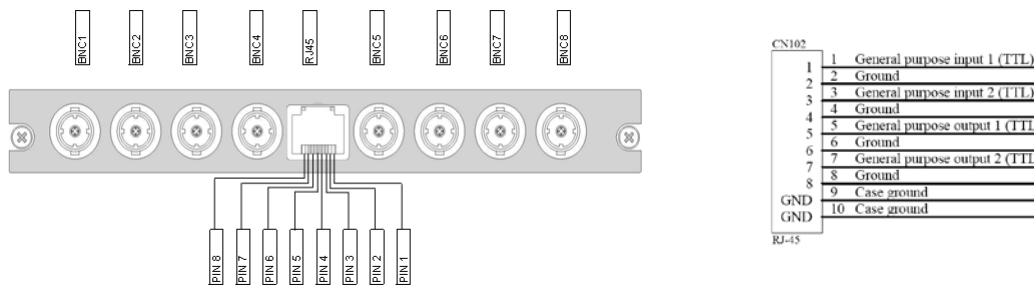
Setting 'Switch-Back' [Off, On, BackUp_Fail], only applies when Input-Sel is set to Auto or Auto-GPI, and determines whether the channels can switch back to their original state after an error had occurred, and the status has returned back to Ok.



- Off: channels will not switch back after being recovered from an error, even when channel B_i has an error (see figure above).
- On: channels are allowed to switch back when the status returned to Ok.
- BackUp_Fail: channels only switch back when input B_i has an error and A_i is Ok.



Setting 'GPI-Mode' [Mode-1_Non-Latching, Mode-1_Latching, Mode-2] determines the functions of the general purpose input (gpi) contacts of the RJ-45 connector of the BPL11 back panel. Gpi contact 1 controls the selection, when Input-Sel is set to Auto-GPI or GPI-only. The status of the gpi is determined by its connection to the ground (see pin out figure below). This can be done by using a switch or a button. A switch has 2 possibilities its contact can be open or closed; when it is closed (connected to the ground) it is active. And when the contact is open, it is inactive. A button only briefly connects the gpi with the ground, and when pressed toggles the state between active and inactive. A GPI change, so changing the status of the gpi-contact, triggers a switch, and switches to the other channel



- Mode-1_Non-Latching: is level-triggered, should be chosen when a switch is used. When set to the other position triggers a switch.
- Combined mode:
- a. When GPI_1 and GPI_2 are in OFF position, the outputs are in configuration A (see figure 3) A_i on A_o and B_i on B_o
 - b. When GPI_1 = ON and GPI_2 is OFF, the outputs are as in configuration B, A_i on (A_o and B_o)
 - c. When GPI_1 = Off and GPI_2 is ON, the outputs are as in configuration C, B_i on (A_o and B_o)
 - d. When GPI_1 = ON and GPI_2 is ON, the outputs are as in configuration D, Both outputs are swapped. A_i on B_o and B_i on A_o

- Mode-1_Latching: is edge-triggered, should be chosen when a button is used. When pressed results in selecting the other channel.
Combined mode:
 - a. When GPI_1 is Pushed, the configurations are pre-selected. Each time the GPI_1 is Pushed another configuration is selected. The pre-selected state is displayed in the monitoring view of the Card.
 - b. When GPI_2 is Pushed, the pre-selected configuration becomes active (Take).
- Mode-2: is a version with 2 latching GPI contacts. When GPI_1 is active input channel A_i is selected, for output A_o, and when GPI_2 is active input channel B_i is selected for output A_o.
Combined mode:
 - a. When GPI_1 and GPI_2 are OFF, the result is A_i on A_o and B_i on B_o
 - b. When GPI_1 = Pushed, the result is A_i on A_o and B_o. When Pushed again, back to default = A_i on A_o and B_i on B_o
 - c. When GPI_2 = Pushed, the result is B_i on A_o and B_o. When Pushed again, back to default = A_i on A_o and B_i on B_o

GPO1 (pin 5) depicts the status of the active channel on output A_o (A_i=0; B_i=1)