Synapse

2FS10

Dual SDI frame synchronizer

TWINS

AXON
Digital Design

Synapse

TECHNICAL MANUAL
2FS10

Dual SDI frame synchronizer

AXON
Digital Design
Smarter by Listening

Lange Wagenstraat 55

NL-5126 BB Gilze

The Netherlands

Phone: +31 161 850 450

Fax: +31 161 850 499

E-mail: Info@axon.tv

Web: www.axon.tv

● 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.

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

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

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

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

3

Introduction to TWINS

TWINS double-density modules are very efficient as they contain two channels of the same functionality. Cost-effective and space efficient, you can use TWINS modules independently or together with other Synapse cards in Axon's ultimate modular broadcast system.

TWINS is developed to serve two purposes:

- Extremely high space efficiency by providing 36 individual processing channels in 4RU.

- Superb flexibility for the customer: TWINS and other Synapse cards can be housed independently or in the same Synapse frame.

TWINS is an important enhancement of AXON's Synapse range and is another example of how AXON translates future proof and customer compatibility into products.

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.

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 2FS10 will act as a frame synchronizer without any delay. The card will automatically recognize the SDI format.

Changing settings and parameters

The front panel controls or the Synapse Set-Up Software 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

```
┌─────────────────────────┐
│                         │
│       [No Alarms]       │
│                         │
└─────────────────────────┘
```
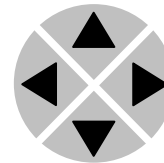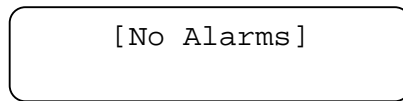
Settings are displayed and changed as follows;

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.

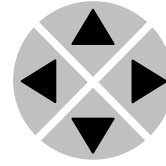With the display as shown below

```
RRC18 [Select Card]
>S01=2FS10
```

Pressing the ► selects the 2FS10 in frame slot 01.

The display changes to indicate that the 2FS10 has been selected. In this example the Settings menu item is indicated.

```
2FS10 [Select Menu]
>Settings
```
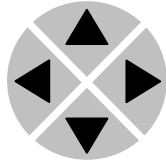
Pressing the ► selects the menu item shown, in this example Settings.

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

The display changes to indicate that the 2FS10 Settings menu item SDI-Format has been selected and shows that it current setting is Auto.

```
2FS10 [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 2FS10 Edit Setting menu item SDI-Format has been selected.

```
2FS10 [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.

Synapse Setup Software

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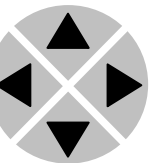
Each Synapse frame is addressed through its rack controller's unique IP address, giving access to each module, its menus and adjustment items. The Synapse Setup software has access to data contained within the Synapse module and displays it on a GUI. The software has an intuitive structure following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

Having selected the desired Frame and Module from the GUI Synapse Network View, select the menu item that you wish to open. Opening the menu item gives a complete list of available properties with their associated Value.

For example to change a setting e.g. SDI-Format, select SDI-Format form the list of settings by 'double clicking' to open a dialogue box. The dialogue box allows parameters to be changed or set to default value. On completion close the dialogue box.

Menu Structure Example

Slot	Module	Item	Parameter	Setting
▲				
▲				
S02		Identity		
▲		▲		
S01	2FS10 ►	Settings ►	Standard_dig ►	Auto
▼		▼	▼	▼
S00	RRC18	Status	Mode	625
		▼	▼	▼
		Events	Ref-Input	525
			▼	
			H-Delay	
			▼	
			▼	

NOTE: Further information about Front Panel Control and Synapse Setup Software can be obtained from the RRC18 and RRC04 operational manuals.

4 The 2FS10 Card

Introduction

The 2FS10 is a broadcast quality full spec dual channel frame synchronizer/autophaser. Two fully independent free running signals can be synchronized to the same Black & Burst reference. The 2FS10 is fully transparent for embedded audio. It has a delay mode, line synchronizer, V-bit, and tracking audio output.

Three Serial Digital Outputs

Three processed digital outputs are available for each input.

Automatic Standard Selection

Both SDI inputs channels have an Automatic standard selection option. 625 AND 525 are the recognized standards.

Back planes

The BPL01 and the BPL11 are the available backplanes for the 2FS10. When tracking pulse and/or GPI input are required, it is necessary to use the BPL11. For more info on connections, refer to Chapter 10.

Miscellaneous

The 2FS10 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 2FS10 can be controlled by AXON Synapse set-up software.

A and B input

A and B is indicated in the software, 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 2FS10 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 Synapse Setup software.

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

SDI-Format

The `SDI-format` menu item selects the input video standard; either `525`, `625` and `Auto` can be selected. In `Auto` mode care should be taken when the H-Delay is outside the 525 limit. When the input is disturbed temporally, the card switches from 625 to 525 and vice versa.

If this occurs the H-Delay and V-Delay are limited to the 525 range. Also see H-Delay and V-Delay

Mode

`Synchronize` and `Delay` mode can be selected in the `Mode` menu. In `Synchronize` mode, the Autophaser/Line synchronizer is active. In `Delay` mode a reference is not required; the output timing is derived from the input signal.

The default setting is `Synchronize`.

Synchronizing Mode: When `Mode` is set to `Synchronize` and the card is locked to a reference, the card is in synchronizing mode, and the following timing is of importance. The minimum delay between input and output signal (output advanced) is 1.27 lines. (NOTE that it is referred to the output signal so it takes the H-V-delay into account) The maximum delay between input and output signal (output advanced) is '1frame' + 0.27 lines. Due to a hysteresis, when the timing between input and output is from 0.27 lines to 1.27 lines, it is not possible to say whether the card is in a frame delay or not. The maximum delay between the input and output signal (output advanced) to ensure that the card has a frame delay is '1frame' + 0.27 lines.

Delay Mode: When `Mode` is set to `Delay`, the card is in Delay Mode. In this mode the delay between input and output is 48 samples (1.8μsec). The H-Delay and V-Delay settings give a delay in addition of this. `Synchronize` and `Delay` mode can be selected within the mode menu. In `Synchronize` mode, the Autophaser/Line synchroniser is active. In `Delay` mode a reference is not required, the output timing is derived from the SDI Input.

Ref-Input   If the Output lock setting is set to Reference, this setting allows the user to select ref 1, 2, Auto-Format or Auto_Backup.

If the Auto-Format setting is selected, the card will check whether the reference is 1080i-50,1080p-25, 720p-50 and 720p-25 (REF1), or 1080i-60, 1080p-30, 720p-60 and 720p-30 (REF2).

When set to Auto_Backup the card chooses ref1 as its source. Whenever ref1 fails, it will switch to ref 2 (only for SFR08 and SFR18 frames and only when ref2 offers the same ref format as ref 1). When ref 1 is back up again, it will only automatically switch back to ref 1 when ref 2 fails.

The default setting is 1.

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 RJ45 connector. 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.

Note: Please refer to the description of Ref input for synchronization and timing information.

11

Input-Loss | Input-loss enables the capture of the last available video information in case of input signal loss. Panic freeze always uses Field mode. If a black picture output is required then select Black. A Green output is also available.

The settings of Input-Loss are Freeze, Black and Green.

The default setting is Freeze.

Ext-Frz | Ext-Freeze sets the external freeze input. Two separate GPI inputs are possible (See Chapter 10 on connections).

Disabled: function is not active, Enabled : function is activated.

Default setting is Disabled.

A_Freeze | A_Freeze enables the capture of one Video Field.

The settings of Freeze are On or Off.

Default is OFF.

A_VI-Ins | The Video Index insertion menu enables the generation of Video Index information. Video Index is used to trigger cascaded equipment that process wide screen manipulation, such as aspect ratio converters.

A_VI-Ins:

The Video Index data insertion recognizes 16 different modes. These modes are divided into 2 groups, 4:3 and 16:9, each group having 8 sub-categories numbered 0-7. Valid data ranges are 4:3_0, 4:3_1, 4:3_2, etc., to 16:9_0, 16:9_1, 16:9_2 etc

Default is Off

A_Blank-ANC | A_Blank-ANC allows to blank ancillary data in either the horizontal or vertical interval or both.

H- the horizontal data is blanked,

V- the vertical data is blanked,

H+V- the horizontal and vertical data is blanked.

Off the horizontal and vertical data is passed.

The default setting is OFF.

A_EDH-Gen | A_EDH-Gen allows the user to switch the built-in EDH generator on and off. The EDH generator inserts EDH into the output signal.

The default setting is ON

B_Freeze | B_Freeze enables the capture of one Video Field.

The settings of Freeze are On or Off.

Default is OFF.

B_VI-Ins | The Video Index insertion menu enables the generation of Video Index information. Video Index is used to trigger cascaded equipment that process wide screen manipulation such as aspect ratio converters.

B_VI-Ins:

The Video Index data insertion recognises 16 different modes. These modes are divided into 2 groups, 4:3 and 16:9, each group having 8 sub-categories numbered 0-7. Valid data ranges are 4:3_0, 4:3_1, 4:3_2, etc., to 16:9_0, 16:9_1, 16:9_2 etc

Default is Off

B_Blank-ANC | A_Blank-ANC allows to blank ancillary data in either the horizontal or vertical interval or both.

H- the horizontal data is blanked,

V- the vertical data is blanked,

H+V- the horizontal and vertical data is blanked.

Off the horizontal and vertical data is passed.

The default setting is OFF.

B_EDH-Gen | B_EDH-Gen allows the user to switch the built-in EDH generator on and off. The EDH generator inserts EDH into the output signal.

The default setting is ON.

13

6 Status Menu

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

Format-Det `625` and `525` line standards can be detected as the valid input signal format – 625/50 and 525/60 are recognised as valid inputs.

Reference This status item recognizes a valid reference input on the chosen genlock input. There is no status feedback when there is no SDI input.

SDI-In_A This status item indicates if a valid serial digital video signal is present in input_A.

SDI-In_B This status item indicates if a valid serial digital video signal is present in input_B

EDH-Stat_A `EDH-Stat_A`, 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.

EDH-Stat_B `EDH-Stat_B`, 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.

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 2FS10 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_A

Input_SDI_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 input is lost an Event will be generated at the priority.

Input_B

Input_SDI_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 input is lost an Event will be generated at the priority.

Ref-Status

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

EDH-Status_A

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

EDH-Status_B

EDH status_B 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 2FS10 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
Input	01_{hex}=INP_LOSS	81_{hex}=INP_RETURN	primary input lost or returned
EDH-Status	03_{hex}=EDH_ERROR	83_{hex}=EDH_OK	EDH error occurred
EDH-Status	03_{hex}=EDH_ERROR	83_{hex}=EDH_OK	EDH error occurred
Ref-Status	02_{hex}=REF_LOSS	82_{hex}=REF_RETURN	reference lost or returned

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 2FS10 card is not configured correctly or has a hardware failure.

Input LED_A This LED indicated the presence of a valid video signal on input A.

Input Led_B This LED indicated the presence of a valid video signal on input B.

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:
- Audio signal 1, 2, 3 or 4 of the local output is clipped.
- ANC Error.
- EDH Error.

DATA ERROR LED_B This led indicates three different types of errors:
- Audio signal 1, 2, 3 or 4 of the local output is clipped.
- ANC Error.
- EDH Error.

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

9 Block Schematic
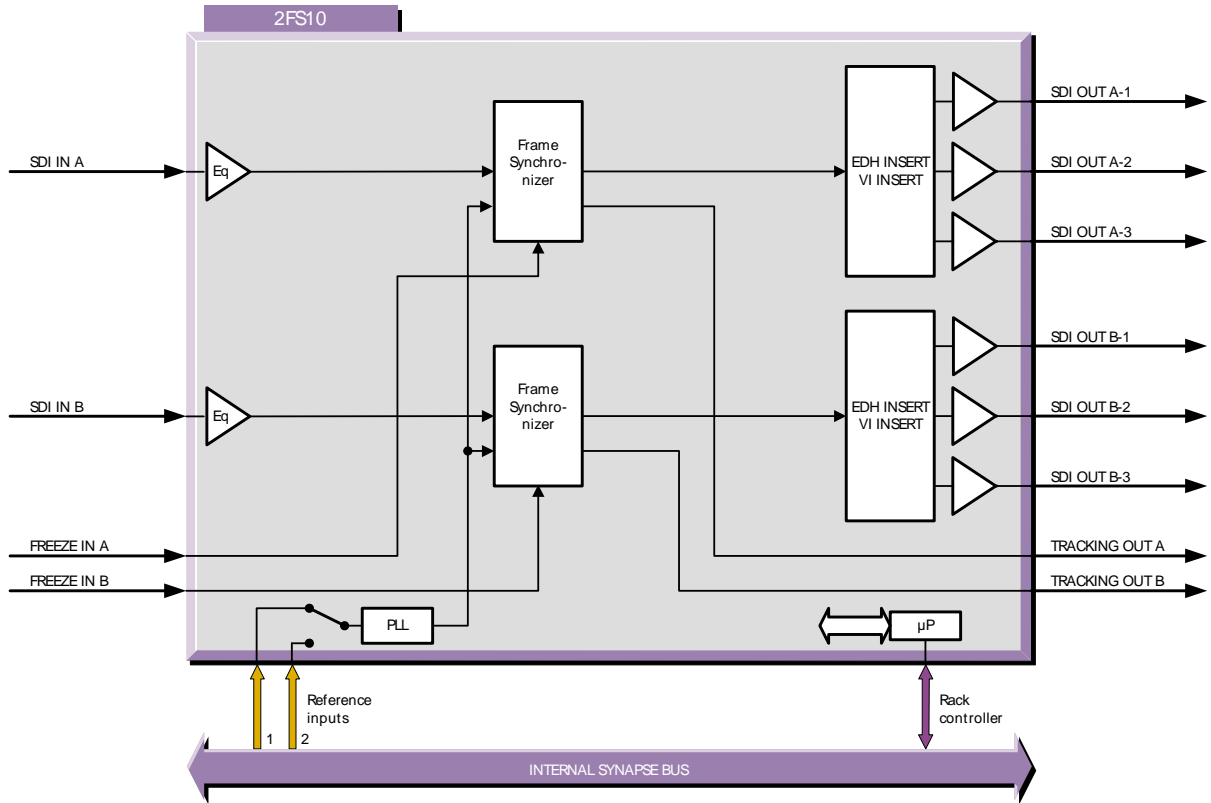
10 Connector Panel
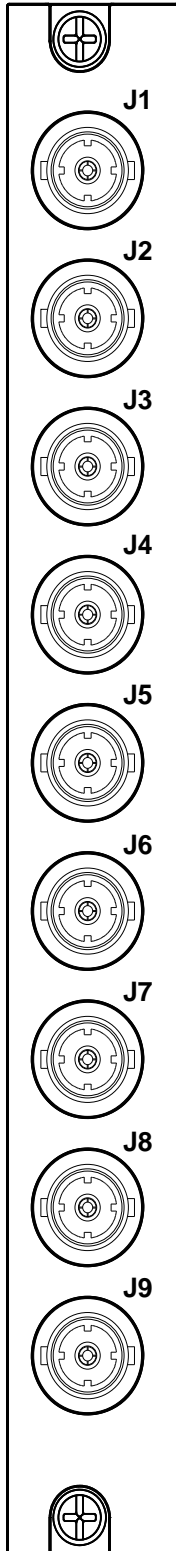
BPL01

J1 = SDI in A

J2 = Processed SDI A out

J3 = Processed SDI A out

J4 = Processed SDI A out

J5 = SDI in B
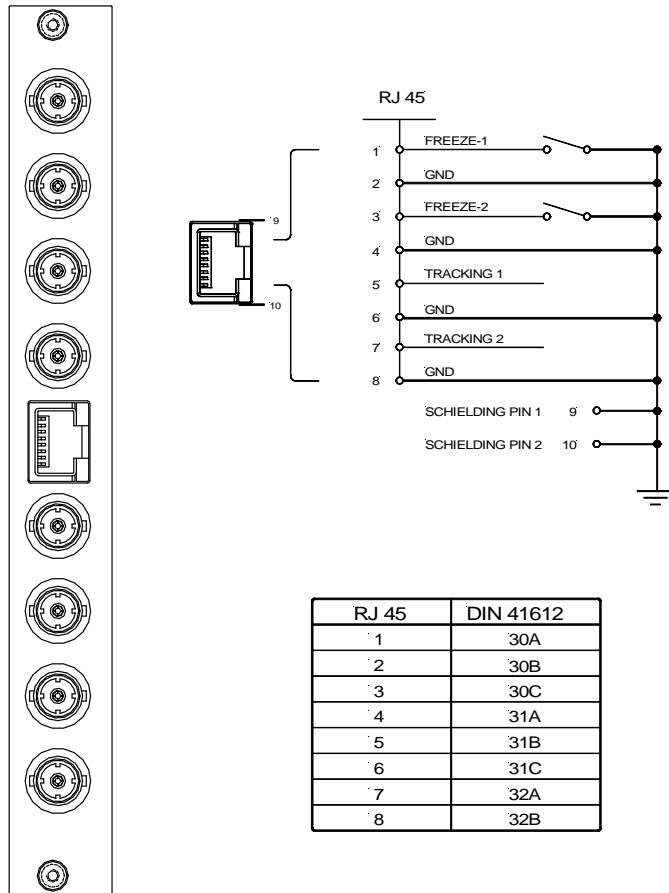
J6 = Processed SDI B out

J7 = Processed SDI B out

J8 = Processed SDI B out.

J9 = not used on BPL01 , BPL11 is a RJ45

  (see connections below)

Fiber backplanes that can used are: BPL11T2_FC/PC, BPL11T2_SC, BPL11R2_FC/PC and BPL11R2_SC

RJ-45 BPL11

RJ 45	DIN 41612
1	30A
2	30B
3	30C
4	31A
5	31B
6	31C
7	32A
8	32B

J1 = SDI_A Input

J2 = Proc SDI Out A

J3 = Proc SDI Out A

J4 = Proc SDI Out A

J5 = RJ45 (tracking and freeze)

J6 = SDI_B Input

J7 = Proc SDI Out A

J8 = Proc SDI Out A

J9 = Proc SDI Out A

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