Synapse

U4T100-U4T140

4K (3840X2160) ULTRA HD 4 WIRE TOOLBOX WITH OPTIONAL DOLBY E PROCESSING

Installation and Operation manual

AXON
THE HEART OF BROADCAST

AXON

Synapse

TECHNICAL MANUAL

U4T100
U4T140

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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: 30-06-2015
Date last revised: 30-06-2015

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 GXG200 HXH200 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.

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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 rack controller 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 (RRC, RRS, ERC or ERS) manual. The method of connecting to a computer using Ethernet is also described in these manuals.

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, SFR08 and SFR Mobile 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

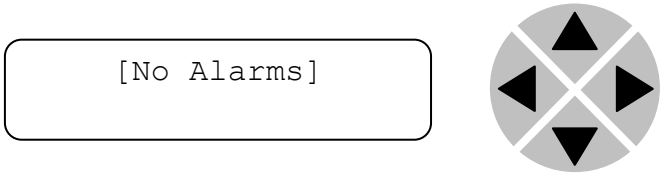
On powering up the Synapse frame, the card set will use basic data and default initialisation settings. All LED's will light during this process. After initialisation, several LED's will remain lit – the exact number and configuration is dependent upon the number of inputs connected and the status of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

Changing settings and parameters

The front panel controls or the Synapse 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 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]
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.

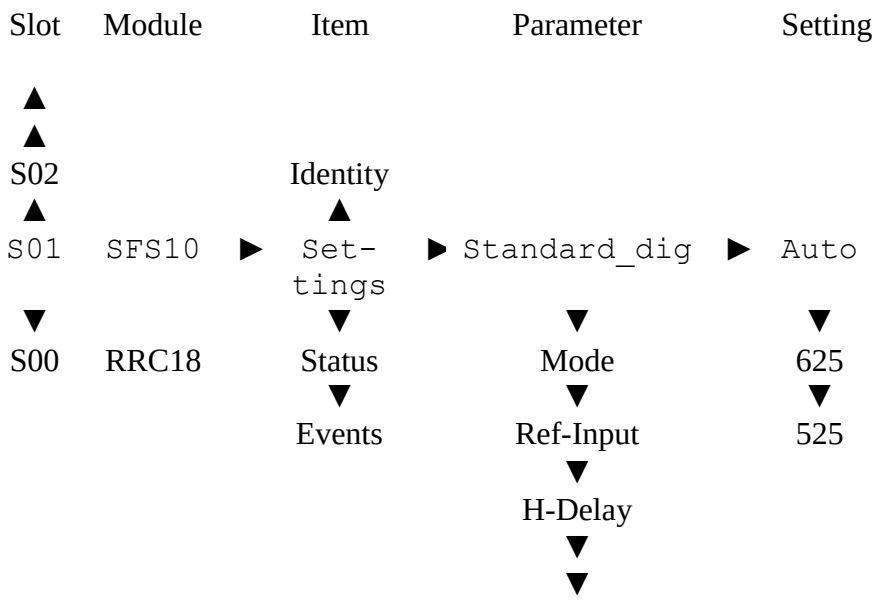
Axon Cortex Software

Synapse 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



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

4 The U4T100/U4T140 Card

Introduction

The U4T100 and U4T140 are 4k (4 wire) production toolboxes that will ease the challenges of a 4 wire production setup where the left top corner (channel A) is used to carry VANC and HANC data like timecode and embedded audio

The I/O is capable of handling four times 1080p formatted as level A, level B in the 4 Quadrant mode or in the 2Si (two sample interleaved) mode.

The '140' has an extra Dolby E encoder and decoder on board and will be capable of handling these signals internally. A quad speed audio bus can be used for additional Dolby E processing or other audio processing by using an ADD-ON card like the DEE28

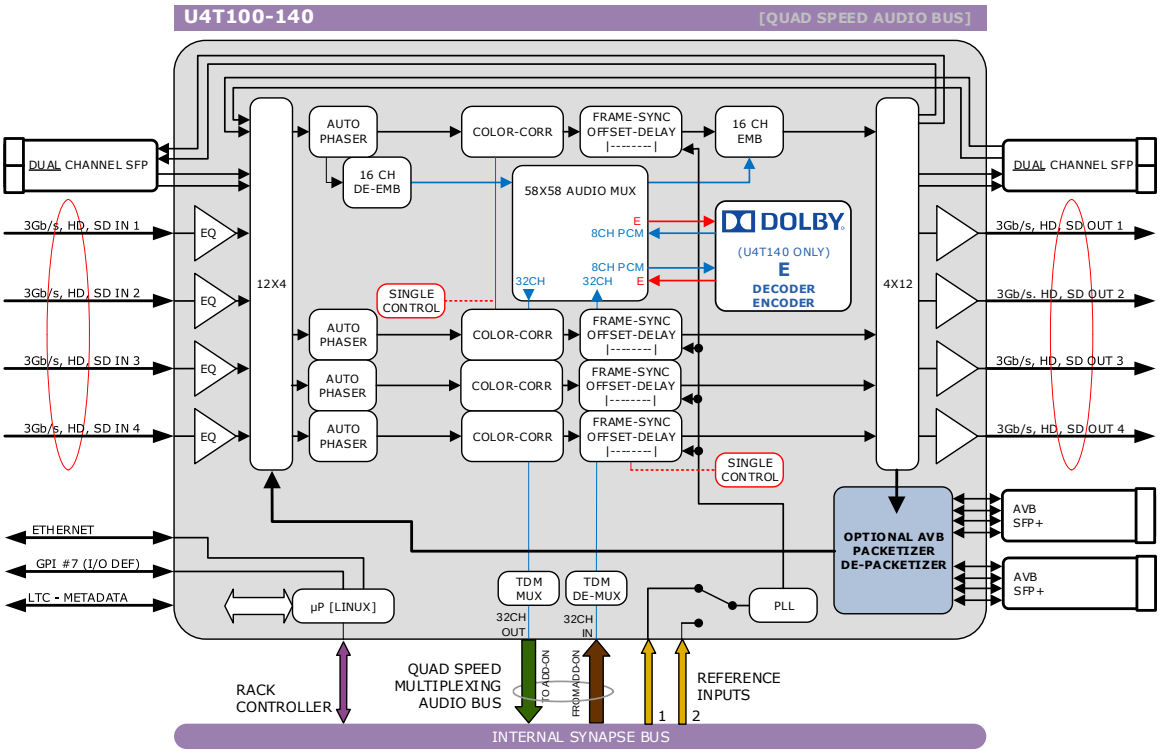
Features

- 4 inputs (in future expandable to 8 inputs)
- 4 internal processing channels
- 4 input autophasers
- 4 Framesyncs and offset delay blocks controllable in two stages (LT+rest)
- RGB color correction of all 4 processing channels as one
- 4 times 1080p50 or 59.94 input
- Level A,B in 4Quadrants or 2Si mode
- 4 outputs (in future expandable to 8 inputs)
- Extreme low intrinsic latency of 5 lines
- 4K 4 wire (3840 x 2160)
- Compatible with the following formats (auto selecting)
  - 1080p59.94
  - 1080p50
- Transparent for 16 channels of embedded audio
- Full control and status monitoring through the front panel of the SFR04/SFR08/SFR18 frame and the Ethernet port (ACP)

Applications

- All 4k 4 wire challenges
- Synchronization
- Auto phasing
- embedding and de-embedding from left top channel
- Encoding and decoding to and from Dolby E embedded data
- 4 wire synchronization and alignment
- Color correction
- Level A to level B or to 2Si conversion in any direction

Block schematic



5 Settings Menu

Introduction

The settings menu displays the current state of each GXG4x0 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. Also the SCP08 control can be used. Please refer to chapter 3 for information on the Synapse front panel control and Cortex.

Note: All items preceded with a #-sign are part of the presets.

SYSTEM SETTINGS

IO-Ctrl

This function isn't currently not accessible but will be enabled in a software release in the future.

IO_Prst_Act

With this item you can manually change the currently active IO settings. Can be any preset between 1 and 8. By default it is set to 1. All menu settings that are preceded with a '# '-prefix under the 'SYSTEM SETTINGS' header are part of the preset.

IO_Prst_Edit

Here you can select which of the 8 selectable IO settings presets you want to edit. Changing this will not change the active preset, unless the currently active preset is the same you are going to edit. All menu settings that are preceded with a '# '-prefix under the 'SYSTEM SETTINGS' header are part of the preset.

PrstEditView

With this setting set to `Follow Active`, the edit preset settings (like for instance `UP_Prst_editA` and `UP_Prst_editB`) will follow the active preset when the active preset is changed. This to avoid confusion when changing the active. Set to `Independent` the edit preset will not automatically follow active preset changes. By default set to `Follow Active`.

#Inp_SelA

With this item you can select which input you want to use for Channel A. It is possible to select physical inputs; `SDI-1, SDI-2, SDI-3, SDI-4, SFP1-1, SFP1-1, SFP1-2, SFP2-1 or SFP2-2`. You can also choose a `Zoneplate` or `Colorbar` as input. The default for this setting is `SDI-1`.

#Inp_SelB

With this item you can select which input you want to use for Channel B. It is possible to select physical inputs; SDI-1, SDI-2, SDI-3, SDI-4, SFP1-1, SFP1-1, SFP1-2, SFP2-1 or SFP2-2. You can also choose a Zoneplate or Colorbar as input. The default for this setting is SDI-2.

#Inp_SelC

With this item you can select which input you want to use for Channel B. It is possible to select physical inputs; SDI-1, SDI-2, SDI-3, SDI-4, SFP1-1, SFP1-1, SFP1-2, SFP2-1 or SFP2-2. You can also choose a Zoneplate or Colorbar as input. The default for this setting is SDI-3.

#Inp_SelD

With this item you can select which input you want to use for Channel B. It is possible to select physical inputs; SDI-1, SDI-2, SDI-3, SDI-4, SFP1-1, SFP1-1, SFP1-2, SFP2-1 or SFP2-2. You can also choose a Zoneplate or Colorbar as input. The default for this setting is SDI-4.

#Out-FrmtA

With Out-Frmt you can set what the output format should be. Possible settings are:

- 1080p60, 1080p50 (default)
- 1080i60, 1080i50
- 720p60, 720p50
- SD525, SD625

#Output-MapA

With output map you can select the output mapping according level-A or Level-B Dual Link. In Auto (default) it follows the detected mapping on the input.

#4K_Map_A

This sets the output mapping of the 4K outputs. Can be set to 4 channels 4 quadrants (4Ch_4Quadrants) or 4 channels sample interleaved (4Ch_SI) . Default is 4Ch_4Quadrants.

#F-delayA ~ #F-delayD

F-Delay sets the amount of delayed Frames for each corresponding input. The available range is from 0 to 50 frames (dependant on the I/O). Default is 0F. The preset master for this is Out-Frmt, hence the '#'-prefix.

Format	Maximum F-delay
1080p50/p60	50fr
1080i50/i60	50fr
720p50/p60	100fr
SD525/625	250fr

#V-delayA ~ #V-delayD	V-Delay setting allows adjustment of the vertical phase of the corresponding 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 the V-Delay is set to 10 TV HD lines, the output signal will be delayed by reference timing + 10 TV HD lines. The signal is delayed (advanced) with respect to the phase of the reference signal. The available range is from 0 to a maximum of 1124 lines (dependant on I/O format). The default setting is 0ln. The preset master for this is Out-Frmt, hence the '#'-prefix.
#H-delayA ~ #H-delayD	The H-Delay setting allows adjustment of the Horizontal phase of the corresponding 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 the H-Delay is set to 10 pixels, the output signal will be delayed by reference timing + 10 pixels. The signal is delayed (advanced) with respect to the phase of the reference signal. The available range is from 0 to a maximum of 5124 pixels (dependant on I/O format). The default setting is 0px. The preset master for this is Out-Frmt, hence the '#'-prefix.
#Freeze_A	Freeze enables the capture of one Video Frame for all 4 channels. The settings of Freeze are On or Off. The default setting is Off.
Lock-Mode	Lock-Mode determines whether the card is locked to his input (SDI1 or SDI2), to the reference (Ref1 or Ref2) or Auto-SDI (SDI with automated switchover in case of ref loss). Ref1 is default
Delay-Status	It is possible to display (in the status menu IODelayA and IODelayB) the processing time of the card in the status menu. This setting allows you to switch this function On or Off. Default setting is Off
PatternSpeed	Sets the speed of the test-pattern (see settings Inp_SelA and Inp_SelB) animation between 0 (still) and 15 (fast). Default 1.
S2031-EmbA	With this setting you set in which line the S2031 data should be inserted. Can be any line between line 8 and line 16. Can also be switched off (causing the S2031 data to not be inserted at all).

Input_Loss_A	Here you can set what the output of channel A should be when the input is lost. Can be `Freeze`, `Colorbar`, `Zoneplate`, `Black`, `Grey` or `Green`.
	VIDEO PROC
GainA ~ GainD	With this setting you control the overall gain of the video of the corresponding channel between 50 and 150%. Default is 100%.
R-GainA ~ R-GainD	`R-Gain` controls the Red gain of the corresponding channel. The control range is between 50% and 150%. The default setting is 100%.
G-GainA ~ G-GainD	`G-Gain` controls the Green gain of each corresponding channel. The control range is between 50% and 150%. The default setting is 100%.
B-GainA ~ B-GainD	`B-Gain` controls the Blue gain of the corresponding channel. The control range is between 50% and 150%. The default setting is 100%.
BlackA ~ BlackD	`Black` controls the total R-G-B Black gain of each corresponding channel. The control range is between –128bit and 127bit. The default setting is 0bit.
R-BlackA ~ R-BlackD	`R-Black` controls the Red-Black of each corresponding channel . The control range is between –128bits and 127 bits in steps of 1 bit The default setting is 0 bit.
G-BlackA ~ G-BlackD	`G-Black` controls the Green-Black of each corresponding. The control range is between –128bits and 127 bits in steps of 1 bit The default setting is 0 bit.
B-BlackA ~ B-BlackD	`B-Black` controls the Blue-Black of each channel. The control range is between –128bits and 127 bits in steps of 1 bit The default setting is 0 bit.

EMBEDDER

Audio_CtrlA

With this item you select how audio proc amp presets for Channel A are controlled: Manually (`Manual`) or via GPI-triggers (`GPI`, `GPI-A`, `GPI-B` or `GPI-C`). Default is `Manual`

Audio_Prst_ActA

With this item you can manually change the currently active preset of channel. Can be any preset between 1 and 16. By default it is set to 1. All menu settings that are preceded with a '`#Ins`'-prefix are part of the preset.

Audio_Prst_EditA

Here you can select which of the 16 selectable presets you want to edit for Channel A. Changing this will not change the active preset, unless the currently active preset is the same you are going to edit. All menu settings that are preceded with a '`#Ins`'-prefix are part of the preset.

#Silence-TimeA

If the embedded audio contains silence, this can be reported by the card. This setting allows you to determine how many seconds it takes before the card reports the silence. This setting can be set in a range from 1 sec to 255 sec. The default setting is 10sec.

#Silence-LevelA

With this setting you set a loudness threshold for the silence detection. Can be set between -100 and -20 dBFS. When the audio goes below this value, a silence alert is triggered. Default is -60dBFS.

#Emb1_GrpSel

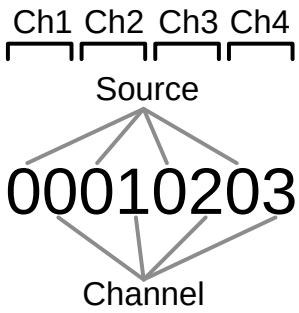
With this setting you can turn on or off the audio embedder groups individually. An embedder group can be turned off (muted) by setting the corresponding group to '_'.
Can be set to one of the following values (default is `1234`):

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

#Emb1_Ch01/04 ~ #Emb1_Ch13/16

These settings allow you to select the source of the audio channels which need to be embedded into the SDI output.
You can choose between the following values:

- Source: SDI_Input_1 (value '0'), channel: Ch1 (value '0') to Ch16 (value 'f')
- Source: SDI_Input_2 (value '1'), channel: Ch1 (value '0') to Ch16 (value 'f')
- Source: Quadspeed bus (value '2'), channel: Ch1 (value '0') to Ch16 (value 'f')
- Source: Quadspeed bus (value '3'), channel: Ch17 (value '0') to Ch32 (value 'f')
- Source: Off (value 'f'), channel: N/A. Mutes the corresponding output channel.



Defaults are (source: SDI_Input_1, channels: straight):

- #Emb1_Ch01/04 = 00010203
- #Emb1_Ch05/08 = 04050607
- #Emb1_Ch09/12 = 08090a0b
- #Emb1_Ch13/16 = 0c0d0e0f

#Emb1_Gain01 ~ #Emb1_Gain16

Adjusts the gain for the corresponding audio channel between -60 and 12dB. Everything below -999 dB means the audio will be muted. Default is 0dB

Note: This setting is only available at the GXG410, which has an audio shuffler option.

#Emb1_Delay01 ~ #Emb1_Delay16

Adjusts the delay of the corresponding audio channel between -5000ms and 5000ms. Default is 0ms.

Note: This setting is only available at the GXG410, which has an audio shuffler option.

#Emb1_Phase01/16

Adjusts the audio phase of the corresponding individual audio channel to 0 deg ('0') or 180 deg ('1'). Default is 0000000000000000 (channel number is counting up from left to right).

GPIO options

Contact _1 ~ Contact_8

In this card it is possible to make the 8 available GPI contacts part of a GPI pool that can control the various functions in the card separately (all `Xx_Ctrl` items of the menu). With these item you can select which pool the corresponding GPI is part of. You can also choose to not use the corresponding GPI at all by setting it to `Off`. Possible settings are:

- `GPI A`: part of GPI-A pool, triggered once Take A is closed.
- `GPI B`: part of GPI-B pool, triggered once Take B is closed.
- `GPI C`: part of GPI-C pool, triggered once Take C is closed.

Please refer to 'Appendix 3: GPI's explained' for a more elaborate explanation of the GPI settings and status items.

GPI_A-Take ~ GPI_C-Take

Selects a take contact for the corresponding GPI pool. Possible settings are:

- `Off`: No take contact is defined, and values on the GPI contact are taken instantly.
- `Contact_1 ~ Contact_8`: The selected contact is used as a Take command for the corresponding pool. Closing the selected contact results in the card latching the value provided on the selected contacts for that pool.

Please refer to 'Appendix 3: GPI's explained' for a more elaborate explanation of the GPI settings and status items.

GPI_A-mode ~ GPI_C-mode

Selects the mode for the corresponding GPI pool. Possible settings are:

- `Prio`: Each contact triggers another value, so values are one-hot encoded.
- `Prio_latched`: This mode functions like `Prio` Mode, but the card latches the value. Each contact triggers another value, so values are one-hot encoded. Use this mode when using pushbuttons.
- `Binary`: Values are coded in a binary fashion, with code "00000" coding for a starting value of 1, as can be seen in the GPI status items.

Please refer to 'Appendix 3: GPI's explained' for a more elaborate explanation of the GPI settings and status items.

NETWORK

IP_Conf0

With this setting you can let the card obtain an IP address automatically via `DHCP`, or appoint a `manual` set IP address. By default this setting is set to `Manual`.

mIP0

When `IP_Conf0` is set to `manual`, you can type in the preferred IP address here. By default it is set to 172.16.1.2

mNM0

With `IP_Conf0` set to `manual`, with this setting you can set a Netmask. Default is 255.255.0.0

mGW0

With `IP_Conf0` set to `manual`, this setting let you set a Standard Gateway. Default is set to 172.16.0.1

NetwPrefix0

Here you can set the proper network prefix if required.

6 Status Menu

Introduction

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

SFP STATUS

SFP1-Vendor

These status item display the name of the vendor of the SFP input/output module A.

SFP1-Type

These status items display the type name/number of SFP input/output module A.

SFP1-Temp-Stat

These indicate whether the temperature of SFP input/output module A is `Too_High`, `High`, `OK`, `Low` or `Too_Low`. Can also be `NA` in case Temperature monitoring is not available or the module is not inserted.

SFP1-Volt-Stat

These indicate whether the voltage usage of SFP input/output module A is `Too_High`, `High`, `OK`, `Low` or `Too_Low`. Can also be `NA` in case Voltage monitoring is not available or the module is not inserted.

Port1/2-Enabled

These item indicate whether the corresponding output port on SFP output module A is `enabled`, `disabled` or `NA` (Not available, when no input signal is available or an input module is inserted.)

Port1/2-Power

These status items indicate the current transmitter power of the specified port on SFP output module A between 0mW and 6.55mW. When a receiver is installed or no SFP module is inserted this value is 0.

Port1/2-Power-Stat

These indicate whether the output power of the specified port on SFP output module A is `Too_High`, `High`, `OK`, `Low` or `Too_Low`. Can also be `NA` in case of an input module or no module is inserted.

Port1/2-Bias

These status items indicate the current laser bias of the specified port on SFP module A is between 0mA and 300mA. When there is a non fiber SFP or an input module is inserted, this value will be 0.

Port1/2-Bias-Stat

These indicate whether the laser bias of the specified port on SFP output module A is `Too_High`, `High`, `OK`, `Low` or `Too_Low`. This can also be `NA` in case laser bias monitoring is not available or no output module is inserted.

Port1/2-Wavelength	Indicates the current wave length of the corresponding output port on the SFP output module A between 0nm and 2000nm. When there is a non fiber SFP or RX module installed, this value will be 0.
SFP2-Vendor	These status item display the name of the vendor of the SFP input/output module B.
SFP2-Type	These status items display the type name/number of SFP input/output module B.
SFP2-Temp-Stat	These indicate whether the above indicated temperature of SFP input/output module B is `Too_High`, `High`, `OK`, `Low` or `Too_Low`. This can also be `NA` in case Temperature monitoring is not available or the module is not inserted.
SFP2-Volt-Stat	These indicate whether the above indicated voltage usage of SFP input/output module B is `Too_High`, `High`, `OK`, `Low` or `Too_Low`. This can also be `NA` in case Voltage monitoring is not available or the module is not inserted.
Port3/4-Enabled	These item indicate whether the corresponding output on SFP output module is `enabled`, `disabled` or `NA` (Not available, when no input signal is available or an input module is inserted)
Port3/4-Power	These status items indicate the current transmitter power of the specified port on SFP output module B between 0mW and 6.55mW. When an input module is inserted or no SFP module is inserted this value is 0.
Port3/4-Power-Stat	These indicate whether the output power of the specified port on SFP output module B is `Too_High`, `High`, `OK`, `Low` or `Too_Low`. Can also be `NA` in case of an input module or no module is inserted.
Port3/4-Bias	These status items indicate the current laser bias of the specified port on SFP output module B is between 0mA and 300mA. When there is a non fiber SFP or RX SFP installed, this value will be 0.
Port3/4-Bias-Stat	These indicate whether the laser bias of the specified port on SFP output module B is `Too_High`, `High`, `OK`, `Low` or `Too_Low`. This can also be `NA` in case laser bias monitoring is not available or no module is inserted.
Port3/4-Wavelength	Indicates the current wave length of the corresponding output port on SFP output module B between 0nm and 2000nm. When there is a non fiber SFP or RX module installed, this value will be 0.

sInp1 ~ sInp8	This status item indicates the presence and the format of a valid signal on physical input 1 to 8. This is displayed as: ▪ 1080P60 ▪ 1080p50 ▪ 1080i60 ▪ 1080i50 ▪ 1080p30 ▪ 1080p25 ▪ 1080p24 ▪ 1080psf24 ▪ 720p60 ▪ 720p50 ▪ 720p30 ▪ 720p25 ▪ 720p24 ▪ SD525 ▪ SD625
sInpA ~ sInpD	This status item indicates the presence and the format of a valid signal on processing channel A to D. This is displayed as: ▪ 1080P60 ▪ 1080p50 ▪ 1080i60 ▪ 1080i50 ▪ 1080p30 ▪ 1080p25 ▪ 1080p24 ▪ 1080psf24 ▪ 720p60 ▪ 720p50 ▪ 720p30 ▪ 720p25 ▪ 720p24 ▪ SD525 ▪ SD625
sInpA_CRC_EDH ~ sInpD_CRC_EDH	This item indicates CRC and EDH errors on processing channel A to D. Can be: ▪ Off ▪ OK ▪ Error ▪ NA ▪ NoPCM
sInpA_Map ~ sInpD_Map	This item indicates what the mapping of the signal is on processing channel A to D. Can be: ▪ Level A ▪ Level B ▪ NA

IODelayA ~ IODelayD	Displays the total delay in ms of outputs A to D. Can be a value between `0ms` and `16383ms`.
FunctionA	Displays the current mode/function of processing channel A. Can be: ▪ `Up` ▪ `Down` ▪ `Cross` ▪ `Trans` ▪ `Na` ▪ `TestPattern`
Ref-Format	Displays whether there is a correct reference and what the connected reference format is: Can be. ▪ `NA` ▪ `NTSC/480i` ▪ `PAL/576i` ▪ `720p` ▪ `1080i` ▪ `1080p`
GPI	Displays the currently closed GPI contacts. This is displayed as for instance 1_3_ when contacts 1 and 3 are closed and for instance _234 when contacts 2, 3 and 4 are closed.
GPIA	Displays the current value of GPI pool A
GPIB	Displays the current value of GPI pool B
GPIC	Displays the current value of GPI pool C
SDIADemFrmt01/02 ~ SDIADemFrmt15/16	These status items indicate the detected audio format of each audio pair in the de-embedder of SDI input 1. Can be one of the following formats: ▪ `N/A` ▪ `PCM` ▪ `Null` ▪ `AC-3` ▪ `TimeStmp` ▪ `MPEG-1` ▪ `MPEG-2` ▪ `SMPTE-KLV` ▪ `Dolby E` ▪ `Caption data` ▪ `UserDef` ▪ `Rsvd` ▪ `Enh Ac-3`

EmbStat_A	Displays the status of the individual audio channels of the embedder output. Displayed as for instance SC_PPPPPPPPPPPP, when channel 1 is Silence, channel 2 is Clipped, channel 3 is NA (not available) and channel 4 to 16 are Present
AddOnFrmtInA1/2 ~ AddOnFrmtInD3/D4	These status items indicate the detected audio format of each audio pair in the add-on bus. Can be one of the following formats: ▪ N/A ▪ PCM ▪ Null ▪ AC-3 ▪ TimeStmp ▪ MPEG-1 ▪ MPEG-2 ▪ SMPTE-KLV ▪ Dolby E ▪ Caption data ▪ UserDef ▪ Rsvd ▪ Enh Ac-3
AddOnFrmtIn01/02 ~ AddOnFrmtIn31/32	These status items indicate the detected audio format of each audio pair from the quad speed addon bus. Can be one of the following formats: ▪ N/A ▪ PCM ▪ Null ▪ AC-3 ▪ TimeStmp ▪ MPEG-1 ▪ MPEG-2 ▪ SMPTE-KLV ▪ Dolby E ▪ Caption data ▪ UserDef ▪ Rsvd ▪ Enh Ac-3
SOF-E_A1/2A	Displays the start line of a Dolby E frame. Can be a value between 0 and 1124 (dependant on input and output format).
	NET STATUS
IP_Addr0	This item displays the status of the IP address. It can be manual, DHCP asking, 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.

Events

The events reported by the GXG-HXH400-410 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_A 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.

Active_Out_A

Active output A 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 card are:

Event Menu Item	Tag		Description
Announcements	0 or NA	0 or NA	Announcement of report and control values
Input_A	01_{hex}=INPA_LOSS	81_{hex}=INPA_RETURN	input A lost or returned
Reference	03_{hex}=REF_LOSS	83_{hex}=REF_RETURN	reference lost or returned
Acive_Out_A	19_{hex}=IN_B->OUT_A	99_{hex}= IN_A->OUT_A	Input B or input A on outputs A

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 card is not configured correctly or has a hardware failure.

Input_x LED

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

ANC Data LED

Indicates the presence of embedded audio within the input signal.

Reference LED

Indicated the presence of a valid reference signal on the selected reference input connector (ref-1 or ref-2).

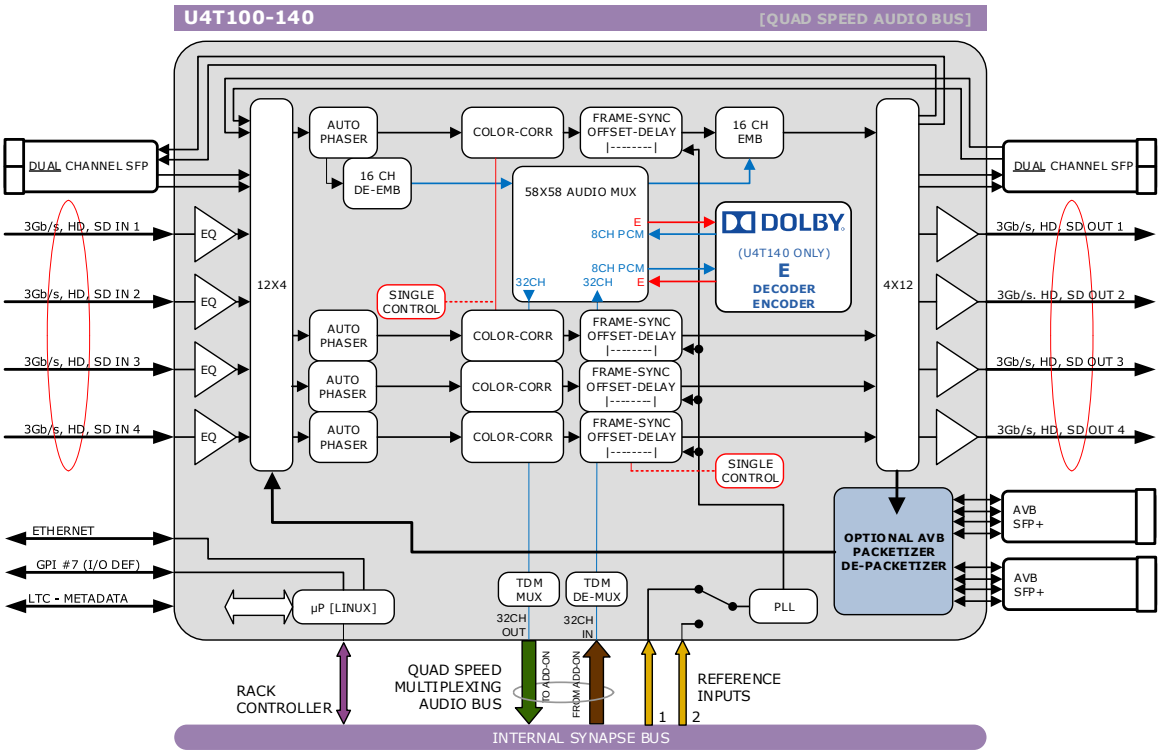
Data Error LED

This LED indicates a CRC error.

Connection LED

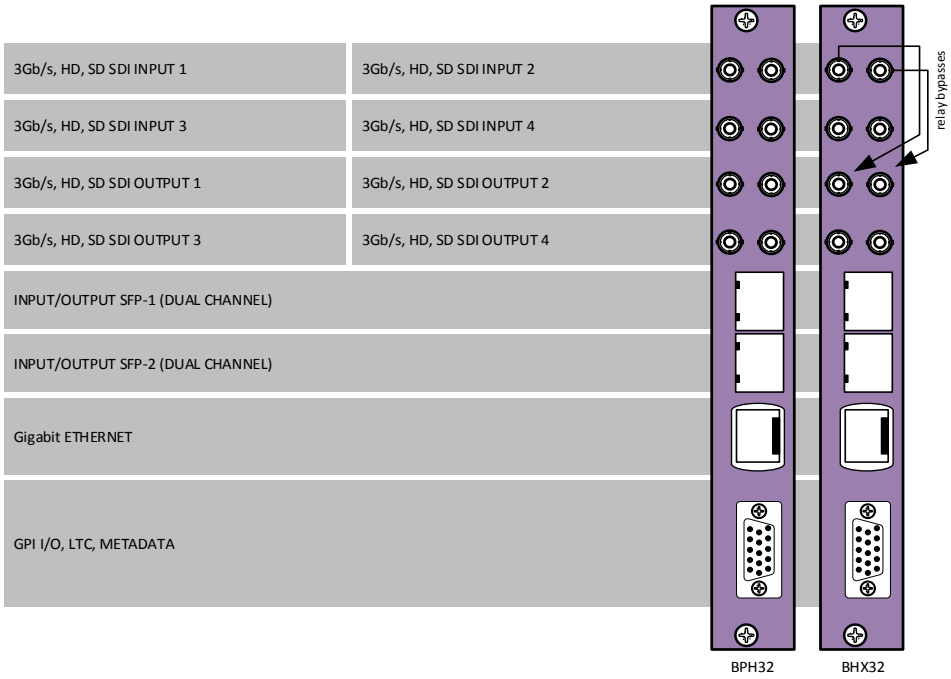
This LED illuminates after the card has initialized. The LED lights for 0.5 seconds every time a connection is made to the card.

9 Block Schematic



10 Connector Panels

The U4T100 and U4T140 can be used with the BPH32 or the BHX32. The following table displays the pinout of these backpanels in combination with the card.



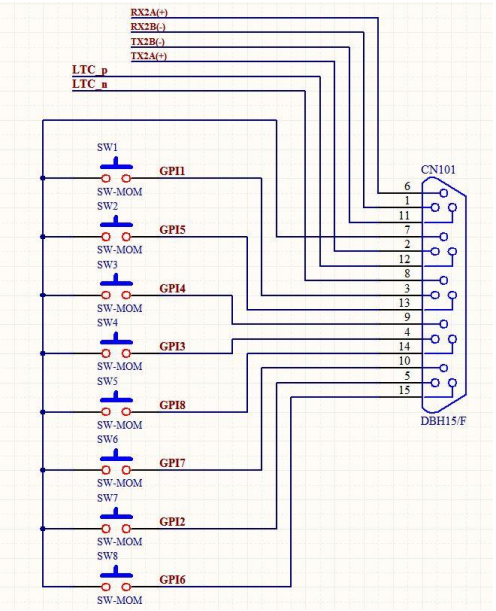
Note Unused inputs and outputs must be terminated with the correct impedance

D-sub pinning

Note: GPI's work in a latching mode

Of the 15-pole subD connector:

pin 01 = RX2B
pin 02 = TX2A
pin 03 = GPI_1
pin 04 = GPI_3
pin 05 = GPI_2
pin 06 = RX2A
pin 07 = GND
pin 08 = LTC-
pin 09 = GPI_4
pin 10 = GPI_7
pin 11 = TX2B
pin 12 = LTC+
pin 13 = GPI_5
pin 14 = GPI_8
pin 15 = GPI_6



Appendix 2 Reprogramming GXGxxx modules

Before you start

Functionality explanation

A Synapse card's functionality is decided by 2 parts: the hardware platform and the software (a.k.a. firmware) that resides on the hardware platform. Changing the firmware of the cards means changing the way the card functions. To keep improving quality and to answer our customer's demands, Axon sometimes releases new software revisions of Synapse cards. These software revisions are formatted in 1 file per revision, with a .spf extension. Customers can download these .spf files from our website, or receive them via e-mail from our support so they can upgrade or reprogram their own cards.

Choosing .spf files

Not all .spf files are compatible with all hardware platforms. To know for certain that you are choosing a compatible .spf file you have to know the hardware revision of your card. This revision number can be found in the menu of the card via the control panel on the frames (select card, select 'about', check HW number) or via Cortex (Axon's control software) (select frame, select card, select 'Identity', check 'hardware rev').

Knowing the hardware revision number, you can go to our website (www.axon.tv) and go to our download firmware section. Here you select the card you wish to upgrade. You will see a list of available firmware upgrades of this particular card. The firmware files that are compatible with your card should display your card's hardware revision number in table next to "Hardware versions". If this is not the case you will not be able to upgrade your card with that file.

Requirements

For reprogramming or upgrading cards, you need the Cortex program installed on a PC or laptop which is connected to the same network to which the card is connected also. You can download the program free of charge from our website. For this this card you need to use Cortex version v1.091 or later. Updating the card must be done locally (direct connection) through the Ethernet of the backplane. The bottom Ethernet connection must be used.

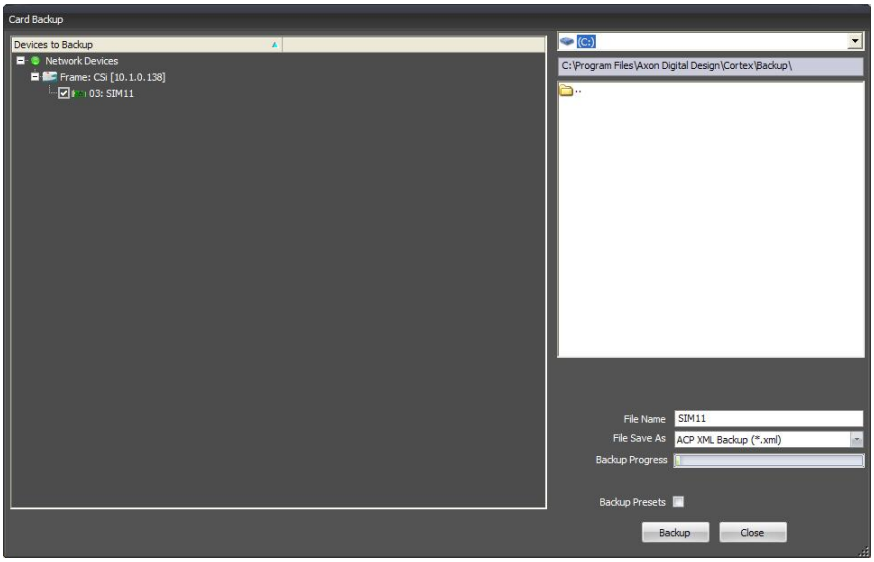
Using Cortex help files

This manual describes how to upgrade cards using Cortex. When you are using Cortex and require card further instructions, please refer to the Cortex help files (select 'Card' in the menu > select 'Upload Firmware' (the firmware uploading window will open) > press F1).

Precautions

Backup your settings

It is advised to back up the settings before upgrading the card. To do this, select the frame and card you want to upgrade. Then choose "Card" in the menu and select "Backup card". An exact copy of the card's menu can be stored as .xml file in the following window. The next image displays the window where this is done.



At your own risk

During the upgrade process, the card will stop functioning for a period of time. Make sure the card you are going to upgrade is currently ***not*** being used by anyone in your company.

Note

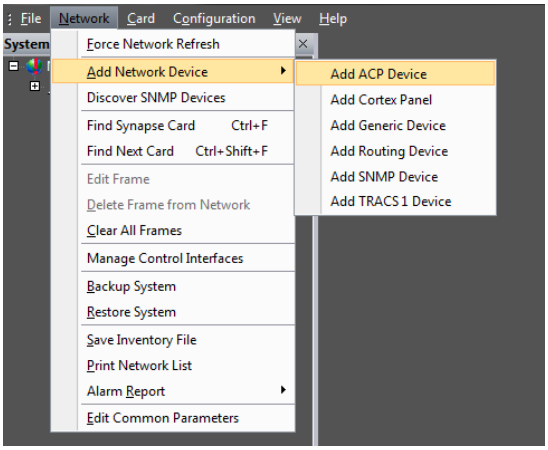
Use cortex version 1.09.01 or later. This software can be downloaded from our website. www.axon.tv

Setting up card

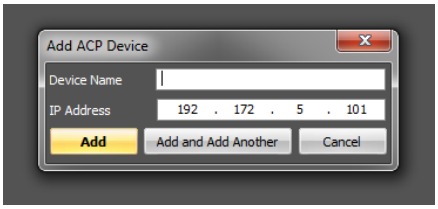
To be able to program the card direct we need to perform two steps. One is setting up of the IP address of the card and second will be making the board recognized as stand alone entity.

To set-up the IP address of the card goto the system view within the Cortex program. Select the HLDxxx and goto the device view tab. Within the device tab you will be able to setup the IP address, netmask and gateway.

The next step is to make the card available as a stand alone card within the system. To add this card you need to go to the network tab at the top of the cortex program. Then go to add network device and choose add ACP device.

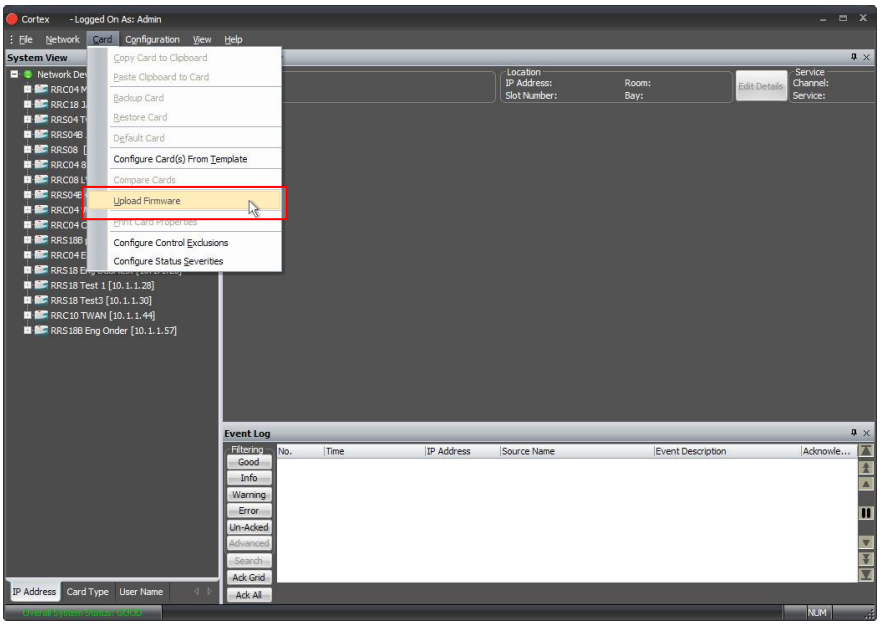


Fill out the name of the card and also the ip address.

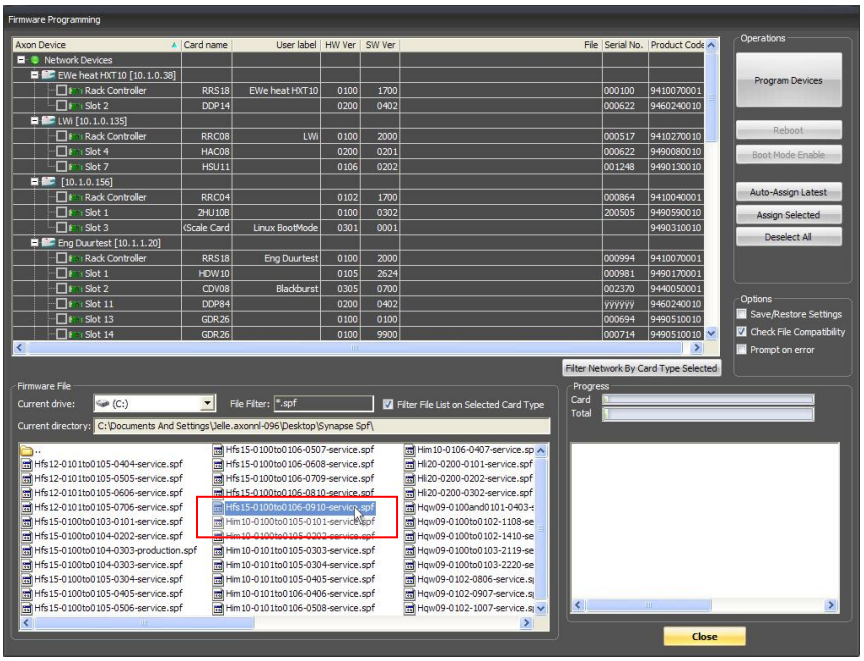


Upload firmware

You can start upgrading the card. To do this, click ‘Card’ in the top menu and select ‘Upload Firmware’ from the dropdown box as displayed below.

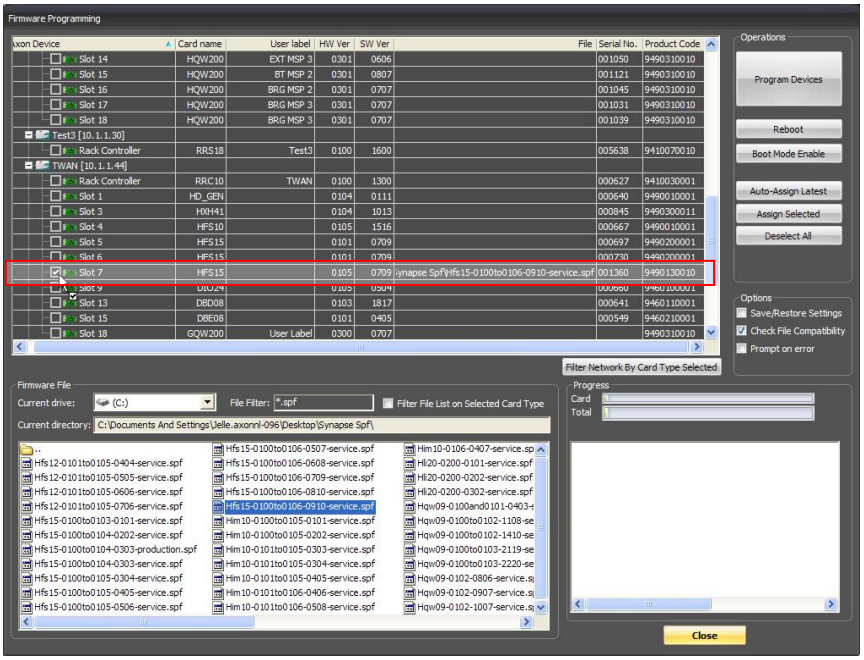


A new window will open, showing you the firmware upload functions. ***At first you must select which .spf file you want to load***. You do this in the buttom dialog as shown below.



To select which .spf you would like to upload into the card, you click the 'Current drive' button and select the folder which holds your .spf files.

When you selected the .spf file, check the card(s) in which you want to load this .spf file. You can load multiple cards with the same .spf file at the same time. When the selected .spf file can not be loaded in the card you try to check an error message will appear in the bottom right box. Selecting a card is done as displayed on the next page.



Testing

When all previous instructions have been completed the card should be functioning properly. We advise however to test the card's functionallity before you are going to put it into real on-air use.

Appendix 3 GPI's explained

Introduction

This appendix describes the functionality of the GPI's generally used within the Synapse based products.

General functionality

The physical contacts of a General Purpose Interface can be assigned by the user. In our cards the General Purpose Interface contacts (GPI contacts) will be named as General Purpose Input (GPI) or General Purpose Output (GPO). The GPI inputs and outputs are assignable to different preset banks. These preset banks (GPI pools) can be used to switch multiple settings at once.
Some examples of these functions:

- Input selection
- Output mode
- Up conversion aspect ratio for channel A and B
- Down conversion aspect ratio for channel A and B
- Cross conversion aspect ratio for channel A and B
- Transparent aspect ratio (equal in-output) for channel A and B
- Insertion of VI, WSS, AFD (S2016) for channel A and B
- Audio shuffling, gain and phase

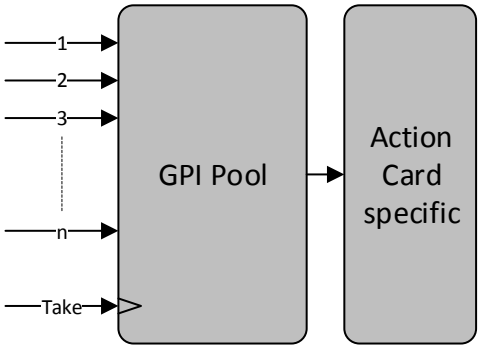
Contact assignment

The physical contacts can be assigned as input or output. In the menu of a card, these will be called `Contact_N` depending on the amount of contacts available. Contacts could be Inputs, outputs or bi-derictional I/O. The `Contact_N` menu item will be used to assign this specific contact to input or output pools. The choices are `Off`, `GPI_A`, `GPI_B`,

GPI_C, …, GPI_N, GPO_A, GPO_B, GPO_C, …, GPO_N depending on the amount of contacts and pools.

Pools

A GPI/GPO pool is a place where contacts are collected to form an output trigger.



Take

The GPI contacts not only can be used as GPI contact but also can be assigned as Take contact. The menu item is called `GPI_n-Take`. Where n is the amount of GPI pools in the product. Every pool can only have one Take contact. There will be no restrictions in assigning the contact to a GPI pool and Take function at the same time. The values will be 1 to x. When assigning a take pin to a pool set to `Prio_Latched` mode, the pool will behave the same as when set to `Prio` mode with a take pin assigned. This is because the take pin overrules the latched functionality of the `Prio_Latched` mode.

Debounce time

The input contacts need to be debounced to assure signal stability. The debounce time can be set in the `GPI-DebounceTime` object in a range of `1-40` ms. This value will be applied to all contacts. In software implementations setting a custom debounce time is not supported due to technical limitations.

Pool Mode: GPI

Every GPI pool can be set up to process the input contacts in three ways. This setting is called `GPI_n-Mode` and can be set into priority `(Prio)`, priority latched (`Prio_Latched`) and `Binary` mode. N is defined as a character in the range from A-Z depending on the number of pools. The default output value of a pool is always 0. This translates to preset 1 in Axon products.
In priority mode, the contact which has the highest priority defines the pool value. Priority is defined as ranging from the least significant bit (low priority) to the most significant bit (high priority). This is essentially a one-hot coding of preset values.
If a pool has three contacts connected and all inputs are high, the output value of the pool will be 3. Another example is when three contacts are connected to a pool with the first and third contact are low and the

second contact is high the output value is 1.

Input 1	Input 2	Input 3	Pool value	Preset nr
0	0	0	1	1
1	0	0	1	1
X	1	0	2	2
X	X	1	3	3

Table 1 Pool value in prio and prio_latched mode

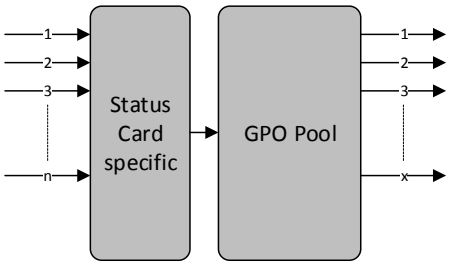
In binary mode, the contacts are interpreted as a binary value of concatenated contacts available in a pool. E.g. assigning two contacts to a GPI pool translates to the following output values.

Input 1	Input 2	Pool value	Preset nr
0	0	1	1
0	1	2	2
1	0	3	3
1	1	4	4

Table 2 Pool value in binary mode

Pool Mode: GPO

Every GPO pool can be set up to process the input values in two ways. This setting is called `GPO_n-Mode` and can be set into Priority (`Prio`) or `Binary` mode. N is defined as a character in the range from A-Z depending on the number of pools. The default output value of a pool is always 0.



Every GPO pool can be set up to process the input values in two ways. This setting is called `GPO_n-Mode` and can be set into Priority (`Prio`) or `Binary` mode. N is defined as a character in the range from A-Z depending on the number of pools. The default output value of a pool is always 0.

In priority mode, the value is translated to one-hot encoding on the output contacts. See table below.

Preset nr	Output 1	Output 2	Output 3	Pool value
1	1	0	0	1
2	0	1	0	2
3	0	0	1	3

Table 3 Pool value in priority mode

In binary mode the input value is exposed on the output contacts as binary value.

Preset nr	Output 1	Output 2	Pool value
1	0	0	1
2	0	1	2
3	1	0	3
4	1	1	4

Table 4 Pool value in binary mode

`GPO_n-Source` is the setting with which a function is assigned to a GPO pool. E.g. when the output format needs to be reflected on the output contacts, this setting may be set to something like `Output_Format`. The contents of the enumeration are product specific.

Statuses: Contact direction

This status `Contact-Dir` shows the direction of the physical contacts. The value will be presented as a concatenated string containing one character per pin: `I` for Input, `O` for output and _ for unassigned contacts.

Statuses: Contact status

`Contact-Status` shows the current logical value of the physical contacts, formatted as a concatenated string containing one character per pin: `1` for asserted, `0` for non-asserted and _ for unassigned.

Statuses: GPI status

`GPI_n` is an integer which reflects the value of the pool.

Statuses: GPO status

`GPO_n` is an integer which reflects the value of the pool.

Example 1: Two pools in binary mode

We are controlling the up-converter presets using Pool A (`Up_CtrlA` set to `GPI_A`) and the output mode setting using Pool B (`Out-mode-Ctrl` set to `GPI_B`). Both pools are working in priority mode. The GPI's need to be set-up in the following way:

- Set GPI_A-Mode to Prio
- Set Contact_1 to GPI_A
- Set Contact_2 to GPI_A
- Set Contact_3 to GPI_A
- Set Contact_4 to GPI_A
- Set GPI_B-Mode to Prio
- Set Contact_5 to GPI_B

Pool A now consists of GPI 1, GPI 2, GPI 3 and GPI 4 in a priority mode, controlling the up-converter preset. Pool B consists only of GPI 5 (also in priority mode), controlling the output mode setting.Pool A now works as follows:

Contact_1 status	Contact_2 status	Contact_3 status	Contact_4 status	GPI_A value
0	0	0	0	Up-conv Preset 1
1	0	0	0	Up-conv Preset 1
0	1	0	0	Up-conv Preset 2
0	0	1	0	Up-conv Preset 3
0	0	0	1	Up-conv Preset 4
0	1	1	0	Up-conv Preset 3 (highest gets priority)
1	1	1	1	Up-conv Preset 4 (highest gets priority)

Table 5 Pool value in priority mode

Pool B now works as follows:

Contact_5 status	GPI_B value
0	A out only
1	B out only

Table 6 Pool value in priority mode

Example 2: One pool in binary mode and one in priority mode

Let's say we would like to control the GXG up-converter presets using Pool A (`Up_CtrlA` set to `GPI_A`) in binary mode and the audio presets using Pool B (`Audio_Ctrl` set to `GPI_B`) in priority mode. We could do the following:

- Set GPI_A-Mode to binary
- Set Contact_1 to GPI_A
- Set Contact_2 to GPI_A
- Set GPI_A-Take to Contact_3
- Set GPI_B-Mode to Prio
- Set Contact_4 to GPI_B
- Set Contact_5 to GPI_B

Pool A now consists of GPI 1, GPI 2 and GPI 3 (as take) in binary mode, controlling the up-converter preset. Pool B now consists of GPI 4 and GPI 5 in priority mode, controlling the audio presets.
Pool A now works as follows:

Contact_1 status	Contact_2 status	Preset value (when Contact_3 (take) is closed)
0	0	Up-converter Preset 1
1	0	Up-converter Preset 2
0	1	Up-converter Preset 3
1	1	Up-converter Preset 4

Table 7 Pool value in binary mode

Pool B now works as follows:

Contact_4 status	Contact_5 status	Preset value
0	0	Audio Preset 1
1	0	Audio Preset 1
0	1	Audio Preset 2
1	1	Audio Preset 2 (because highest gets priority)

Table 8 Pool value in priority mode

Example 3: Two pools in priority mode

Let's say we would like to control the up-converter presets using Pool A (`Up_CtrlA` set to `GPI_A`) in priority mode and the audio presets using Pool B (`Audio_Ctrl` set to `GPI_B`) in priority mode. We could do the following settings:

- Set GPI_A-Mode to Prio
- Set Contact_1 to GPI_A
- Set Contact_2 to GPI_A
- Set GPI_B-Mode to Prio
- Set Contact_3 to GPI_B
- Set Contact_4 to GPI_B

Pool A now consists of GPI 1 and GPI 2 in a priority mode, controlling the Up converter preset. Pool B now consists of GPI 3 and GPI 4 in a priority mode, controlling the audio presets.

Pool A now works as follows:

Contact_1 status	Contact_2 status	Preset value
0	0	Up-converter Preset 1
1	0	Up-converter Preset 1
0	1	Up-converter Preset 2
1	1	Up-converter Preset 2 (because highest gets priority)

Table 9 Pool value in priority mode

Pool B now works as follows:

Contact_3 status	Contact_4 status	Preset value
0	0	Audio Preset 1
1	0	Audio Preset 1
0	1	Audio Preset 2
1	1	Audio Preset 2 (because highest gets priority)

Table 10 Pool value in priority mode

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