



Axon Digital Design

TD: Virtual GPI

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Technical Description

1 Contents

2	Introduction	3
3	General functionality	3
4	Interface & behaviour	3
4.1	Contact assignment	3
4.2	Pools	3
4.3	Take	3
4.4	Debounce Time	4
4.5	Pool Mode	4
4.5.1	GPI	4
4.5.2	GPO	5
4.6	Statuses	5
4.6.1	Contact direction	5
4.6.2	Contact status	5
4.6.3	GPI status	6
4.6.4	GPO status	6
5	Connector pin description	7
6	Examples	8
6.1	Example 1: Two pools in binary mode	8
6.2	Example 2: One pool in binary mode with take, one pool in priority mode	9
6.3	Example 3: Two pools in priority mode	10
7	Cortex/Cerebrum appearance	11

2 Introduction

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

3 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

4 Interface & behaviour

4.1 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-directional 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.

4.2 Pools

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

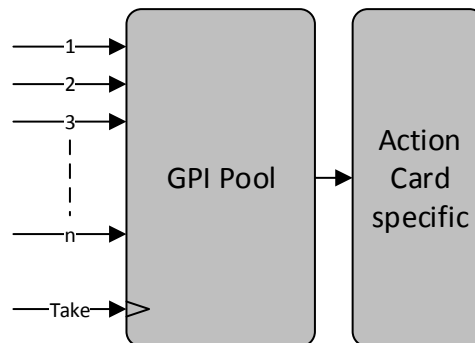


Figure 1 GPI pool

4.3 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.

Technical Description

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.

4.4 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.

4.5 Pool Mode

4.5.1 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 2.

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

Technical Description

4.5.2 GPO

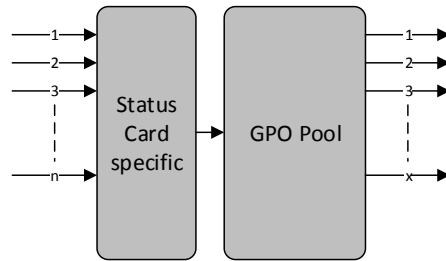


Figure 2 GPO pool

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.

4.6 Statuses

4.6.1 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.

4.6.2 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.

Technical Description

4.6.3 GPI status

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

4.6.4 GPO status

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

5 Connector pin description

This connector will be a generic 15 pin connector which is being researched at this moment.

6 Examples

6.1 Example 1: Two pools in priority 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 (because highest gets priority)
1	1	1	1	Up-conv Preset 4 (because 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

Technical Description

6.2 Example 2: One pool in binary mode with take, one pool 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

Technical Description

6.3 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

Technical Description

7 Cortex/Cerebrum appearance

Also we need to have one way of showing the GPI functionality in Cortex/Cerebrum. In every product we need to add an extra GPI tab. This tab will be called GPI.

It will look like the picture below.

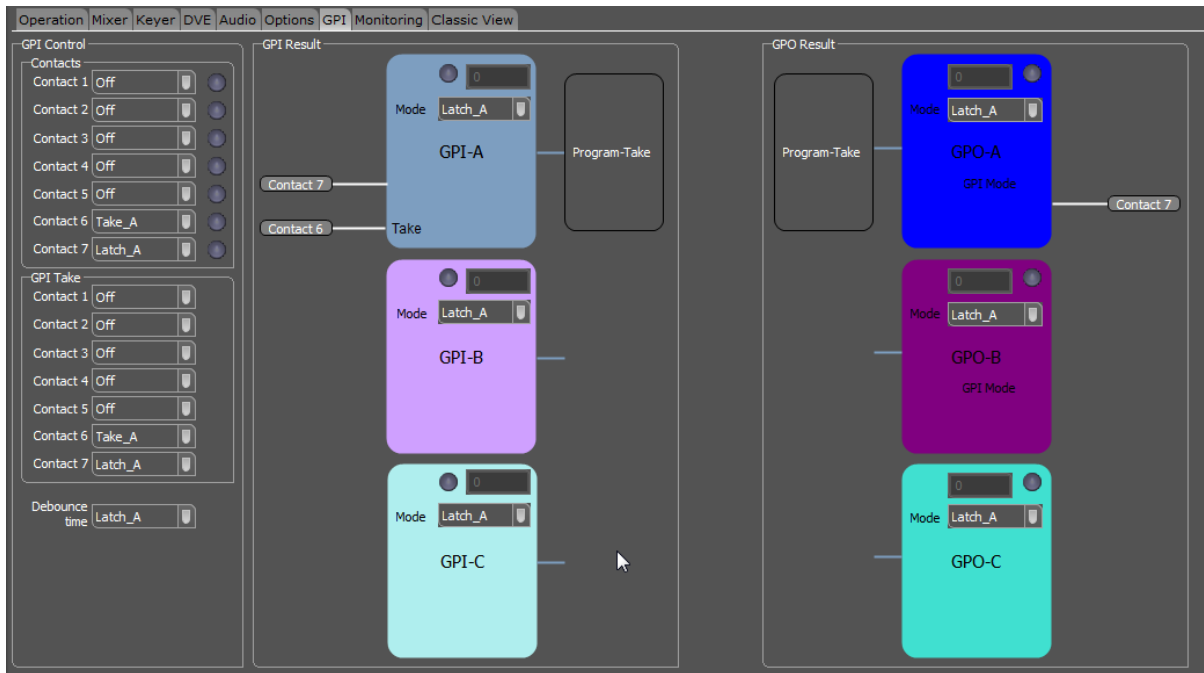


Figure 3 Graphical interface