



# Mezzanine Board Design

## Technical Note

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PENDER ELECTRONIC DESIGN**

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Mezzanine Board Design - Technical Note

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**REVISION HISTORY**

Revision	Date	Page	Description
0.1	20/11/09	All	Draft Issue/New Document

# 1 INTRODUCTION

## 1.1 Background

[Pender Electronic Design](#) and [Aeroflex Gaisler](#) have developed and produced a range of FPGA and ASIC development boards aimed at enabling the demonstration and fast development of Leon processor designs.

In order to provide expanded interface functions and also to enable users of GR Development Boards to implement their own extended functions for the boards, a set of mezzanine connectors are implemented on the boards which provide user access to the memory bus signals and general purpose input/output signals which the user can use to control their own logic.

In order to develop a correct and functioning mezzanine boards, it is of course necessary to ensure that the pin numbering, connector orientation and connector positioning of the mezzanine boards match exactly the definition used on the GR boards themselves.

It has been pointed out by some users that the pin numbering definition used by us does not match the pin numbering indicated on the part datasheets of the type of connectors used for our mezzanine boards, thus leading to confusion. There is a historical reason for this which is explained below, and this document is intended to provide additional clarification and explanation of the convention we use in order to assist users.

If there is any confusion remaining or you have any doubts, please do not hesitate to contact us: [info@pender.ch](mailto:info@pender.ch), as we can help further with this if necessary.

## 1.2 Scope

To provide consistency and in order to allow mezzanine boards to be used as far as possible over a range of board designs, the dimensioning and connector orientations of the mezzanine connectors for GR Boards are the same for most boards.

The information in this document is therefore relevant and applicable for the following GR Boards, at the time of issue of this document:

<b>GR-CPCI-XC4V</b>	<a href="http://www.pender.ch/products_cpci_xc4v.shtml">http://www.pender.ch/products_cpci_xc4v.shtml</a>
<b>GR-CPCI-AT697</b>	<a href="http://www.pender.ch/products_at697.shtml">http://www.pender.ch/products_at697.shtml</a>
<b>GR-CPCI-AX2000</b>	<a href="http://www.pender.ch/products_ax2000.shtml">http://www.pender.ch/products_ax2000.shtml</a>
<b>GR-PCI-XC5V</b>	<a href="http://www.pender.ch/products_pci_xc5v.shtml">http://www.pender.ch/products_pci_xc5v.shtml</a>
<b>GR-UT699</b>	<a href="http://www.gaisler.com/products/GR-CPCI-UT699">http://www.gaisler.com/products/GR-CPCI-UT699</a>
<b>GR-CPCI-AT7913</b>	<a href="http://www.gaisler.com/products/GR-CPCI-AT7913">http://www.gaisler.com/products/GR-CPCI-AT7913</a>
<b>GR-MCC-C</b>	

and the following obsolete boards:

<b>GR-CPCI-XC2V</b>	<a href="http://www.pender.ch/products_cpci_xc2v.shtml">http://www.pender.ch/products_cpci_xc2v.shtml</a>
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Note that this document is concerned with the 'mechanical' layout of the Mezzanine Board and the pin-out of its connectors. For the details of the electrical connections and signal names, please refer to the corresponding user manuals for the boards. Whilst a close similarity has been maintained for the pinning and signals names between the board types, there are some necessary differences that may need to be taken account of in the mezzanine board electrical design

### 1.3 References

- RD-1 GR-CPCI Mezzanine Board definition drawing:  
[http://www.pender.ch/docs/GR-CPCI-EXP\\_pcb\\_definition\\_rev0-1.pdf](http://www.pender.ch/docs/GR-CPCI-EXP_pcb_definition_rev0-1.pdf)
- RD-2 GR-CPCI Mezzanine Board Gerber Files:  
[http://www.pender.ch/docs/GR-CPCI-EXP\\_gerber\\_rev0-1.zip](http://www.pender.ch/docs/GR-CPCI-EXP_gerber_rev0-1.zip)
- RD-3 'Old' Datasheet for Board Side Connector type: Tyco-AMP 177984-5  
[http://www.pender.ch/docs/amp\\_smt\\_connector166533.pdf](http://www.pender.ch/docs/amp_smt_connector166533.pdf)
- RD-4 Datasheet for Board Side Connector type: Tyco-AMP 177984-5  
[http://www.pender.ch/docs/ENG\\_CD\\_5177984\\_A1.pdf](http://www.pender.ch/docs/ENG_CD_5177984_A1.pdf)
- RD-5 Datasheet for Mezzanine Side Connector type: Tyco-AMP 5-179009-5  
[http://www.pender.ch/docs/ENG\\_CD\\_5179009\\_O1.pdf](http://www.pender.ch/docs/ENG_CD_5179009_O1.pdf)

## 2 MEZZANINE BOARD CONNECTORS

Four connectors (plugs) are defined for the Mezzanine board connections:

J8	120 pin connector	TYCO-AMP 177984-5
J9	60 pin connector	TYCO-AMP 177984-2
J10	120 pin connector	TYCO-AMP 177984-5
J11	60 pin connector	TYCO-AMP 177984-2

The Mezzanine connector concept is shown in the figure below.

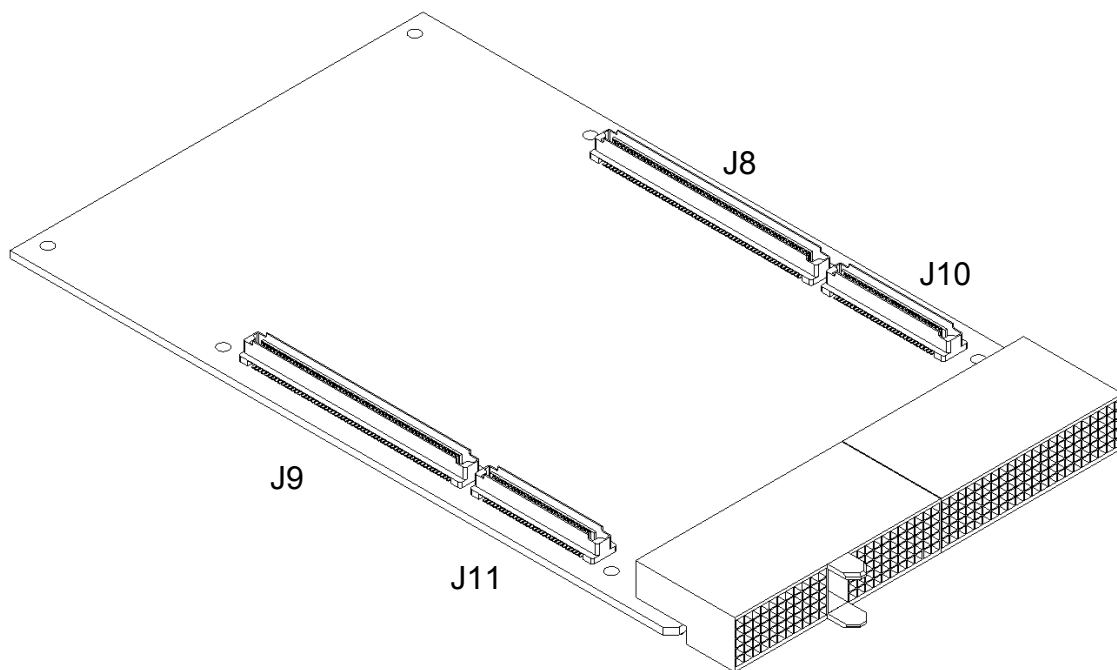


Figure 2-1: Generic Mezzanine Connector Layout

The dimensioning and mechanical positions of these connectors are given in the document RD-1.

Various mating connectors (receptacles) for the mezzanine side of the interface are available, allowing different heights to be achieved between the main board and mezzanine board. Typically, we use connectors from the Tyco AMP 5-179009 series (RD-5) providing a 9mm spacing between the two boards. This is generally adequate to provide sufficient clearance between the components on the main board and the bottom side components of the Mezzanine board in our mezzanine board designs. However, depending on how users implement their own designs, this may need to be checked on a case-by-case basis. If users require height information for component clearance checking, we can of course assist with this for our boards.

The pin numbering of the board connectors which corresponds to the pin numbers on the board schematics is shown on the figure below. This convention is maintained for all the GR boards.

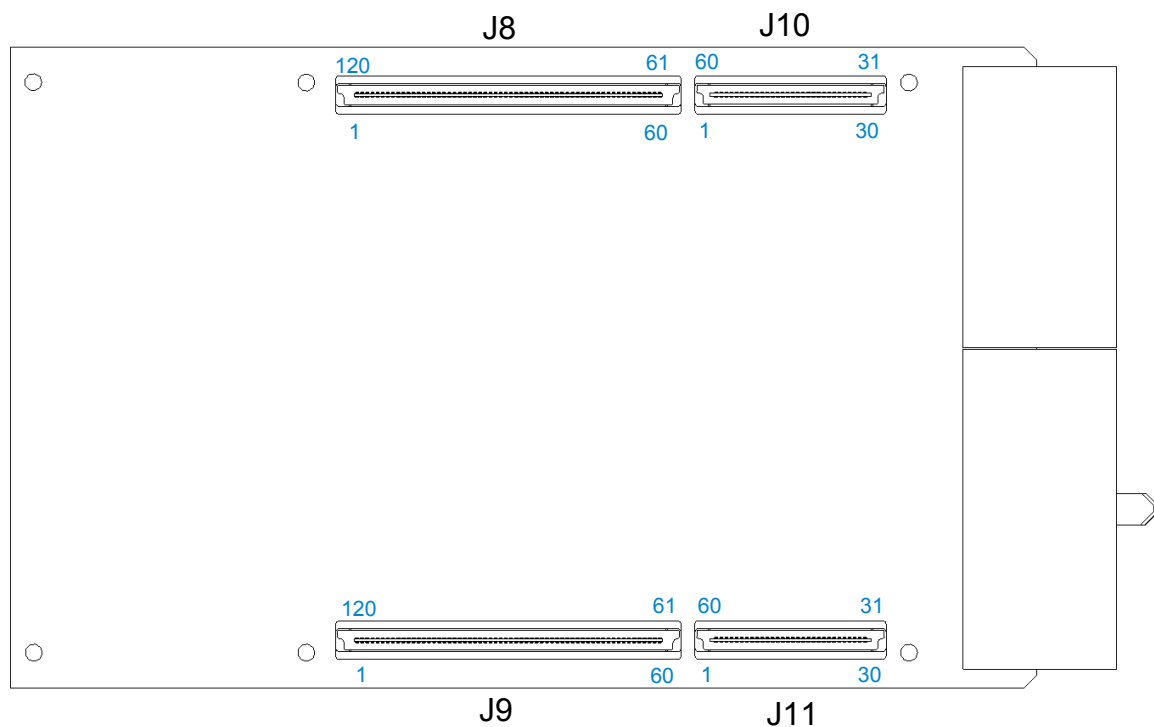


Figure 2-2: Mezzanine Connector Pin Number Ordering

Note that this pin ordering does not match exactly the pin ordering which you will find on the Tyco part datasheets (RD-4) and the corresponding Mezzanine board mating connectors (RD-5). The explanation for this is as follows:

Unfortunately, the original Tyco-AMP connector drawing (RD-3) for the type of connector used on the board does not mark pin 1 and in the original GR-PCI-XC2V boards (2003), a definition for the footprint was chosen. The silkscreen marking on the boards and the documentation marks the pin 1 position which corresponds to this ordering as indicated in Figure 2-2.

However, as was later discovered, the drawing for the mating connector (Mezzanine side) and some newer AMP drawings do define a pin 1 marker, and pin 1 is defined at the opposite end leading to an inconsistency and confusion. (The '120' that AMP shows on their connectors is not a marker for pin 120, but is simply embossed on the plastic to indicate how many pins the connector has).

It was considered to rectify the situation to provide consistency with the datasheet definition. However, since this would generate different revisions of Boards and Documentation and result in sets of inconsistently marked boards and documentation it was decided not to make this revision but instead bring the pin numbering definition to the attention of users.

Designers of mezzanine boards are therefore strongly advised to take account of the information in this document when designing their own Mezzanine boards and to take special care to ensure that their board designs match this document.

Again, if there is any confusion remaining or you have any doubts, please do not hesitate to contact us: [info@pender.ch](mailto:info@pender.ch), as we can help further with this if necessary.

As templates to initially start your Mezzanine board, we can provide both Gerber files for import to your PCB CAD system (RD-2), or the source data in the Altium Designer format. Other formats may be available depending on which tool you use, but we are unfortunately not able to guarantee the accuracy and completeness of the data import/export functionality with other CAD tools.