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The CompactPCI report: Rear panel I/O

Originally approved in 1987 by the IEEE, the 1101 standard has become a worldwide standard for the packaging of electronic equipment, defining the mechanical dimensions of:

- sub-racks
- plug-in boards
- related hardware such as front panel faceplates

As a result of enhancements needed by VITA's VME64x (VME64 Extensions) working group in the mid-'90s, the IEEE expanded the specification and incorporated:

- EMI shields
- front panel keying
- alignment pin
- improved injector/ejector mechanism

While the first CompactPCI systems used the older 1101 mechanics, the final specification (known as IEEE 1101.10) proved to be essential to the success of CompactPCI because of the large insertion and extraction forces – over 100 pounds – required for a 6U CompactPCI board with all five 2 mm connectors installed.

The 1101.10 standard did an excellent job of defining how boards that plug into the front of a chassis should be built, but it did not provide any guidance in the construction of I/O boards intended to bring field wiring into the back of a chassis. Rear panel I/O has long been popular in the telecom industry, bringing semi-permanent data and phone lines into a board and/or cable arrangement that routes these signals through the backplane via double-ended connectors to a front panel plug-in board.

Until recently, the problem with rear panel I/O was a lack of an industry standard, interoperable method of achieving it. Each manufacturer approached the challenge differently. As a result, chassis suppliers could do little but provide a blank rear panel, which meant that OEM manufacturers or integrators had to drill and punch their own holes.

In order to solve this problem, the IEEE created a working group in 1995 to create a standard for the industry. The resulting specification, passed in early 1998, is known as 1101.11. Elegant in its simplicity, 1101.11 defines an environment in the rear of the chassis that mirrors the front of the chassis in virtually every way. Rear panel transition modules, as they are known, look a great deal like their front panel counterpart.

Figure 1 provides an example of a rear panel transition board, while Figure 2 offers a side view of the relationship between:

- a front board
- the backplane
- the rear panel transition board

Many aspects of rear panel transition modules are the same as those defined by 1101.10, including:

- faceplates
- injector/ejectors
- alignment pin
- keying mechanism
- ESD clips

Rear panel transition boards are also the same height as a front panel board:

- 100 mm for 3U
- 233.35 mm for 6U

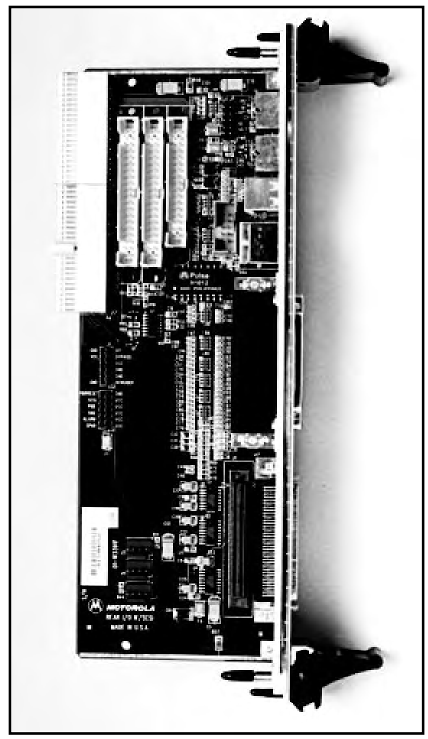

Figure 1

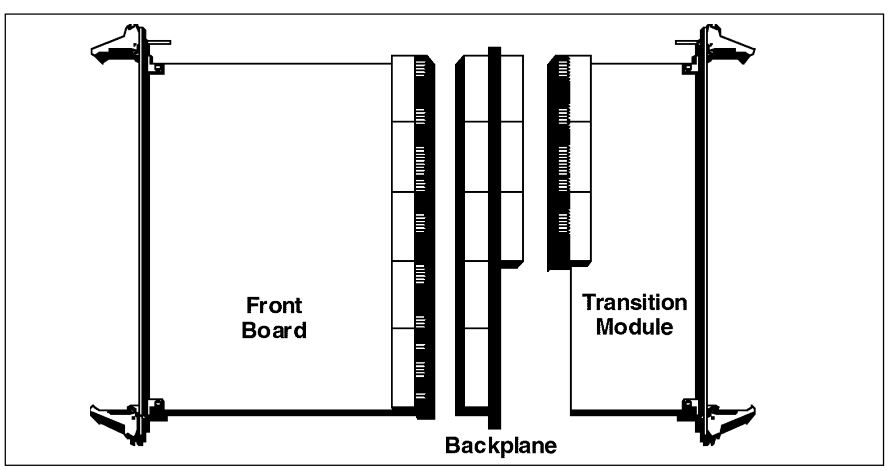

Figure 2

Rear panel I/O for CompactPCI

The specification defines 6 allowable board depths: 60, 80, 100, 120, 140, and 160 mm. While it is not explicitly required, the CompactPCI community is standardizing on the 80 mm depth. However, this is written into the CompactPCI spec, Revision 2.1 as *should*, not as *must*.

The use of a single depth allows chassis suppliers to build standard products without too many variations. It also limits the depth of the overall chassis in order to meet common telecom central office requirements.

Some other differences are evident between rear panel transition modules and their front panel counterparts. Rear panel printed circuit boards are in-line (coplanar) with their corresponding front panel boards, as viewed from the top (see Figure 3). This means that any components and connectors mounted on a rear transition board are mounted on the opposite side of the fiberglass from a front panel board.

Front panel boards (when viewed from the front) have components and connectors mounted on the right side of the board. Rear panel board components and connectors are mounted on the left side of the board when viewed straight-on from the back.

Rear panel CompactPCI boards use only the J3, J4, and J5 connectors to route signals through the backplane P3, P4, and P5 double-ended connectors to the front board. It is important that a rear panel board have J4 installed and that the corresponding P4 be installed in the backplane, because it is highly desirable to use the connector keying and alignment feature provided in 2 mm Type B connectors to prevent misalignment and possible pin damage during insertion. Any connection to the backplane's P1/P2 CompactPCI bus is prohibited for signal loading reasons.

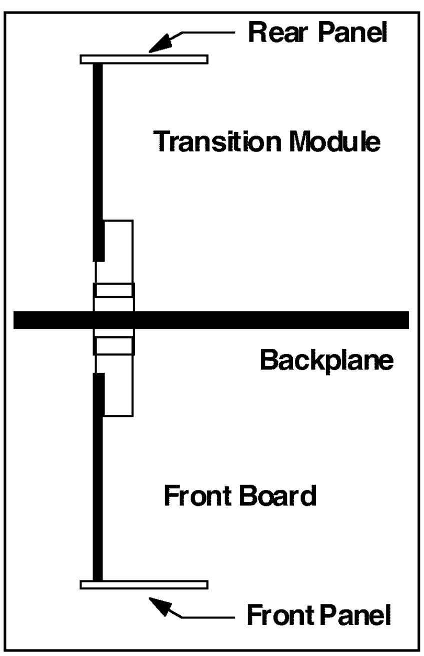

Figure 3

Also, rear panel boards are located in an area of the chassis which is often directly above the system power supply. As such, the forced air cooling in this area may be drastically reduced. This means that is it generally unwise to place many heat-producing active components on a rear board. Components should be largely limited to passive components that might include:

- over-voltage protectors
- filters
- Ethernet transformers

Chassis designers need to consider maintenance when designing chassis incorporating 1101.11 compliant rear I/O boards. It is generally fairly easy to replace a backplane (should that step be required) in a chassis without rear panel capability by removing the backplane through the rear of the box. However, this process can become complicated when the rear panel hardware is used.

The best solution for ease of maintenance is usually the construction of a subassembly consisting of the extrusion rails and card guides. This subassembly can then be easily unbolted and removed should it become necessary to remove the chassis backplane. A typical assembly of this type is shown in Figure 4.

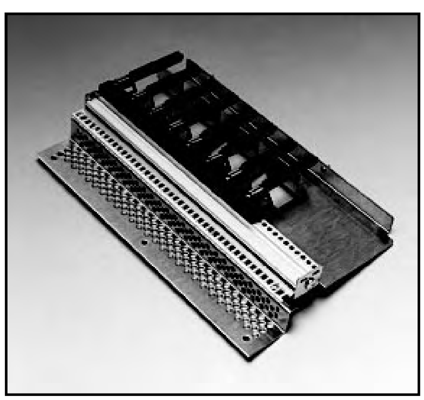

Figure 4

Using the 1101.11 standard in CompactPCI system designs provides inter-operability between chassis suppliers and I/O board vendors. Most CompactPCI backplanes that support rear panel I/O simply pass through all 315 signals on the J3, J4, and J5 connector from the front of the chassis to the rear. An exception to this rule occurs when one of the connectors is used for a sub-bus, as is the case with the CompactPCI Computer Telephony Specification. In practical terms, this would mean obtaining the front panel and rear panel boards as a set from an I/O board supplier. Ω

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