



EBX vs. PC/104, PLATFORM SELECTION CONSIDERATIONS

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INTRODUCTION

There are some remarkable synergies between EBX (Embedded Board eXpandable) and the family of PC/104 buses: PC/104, PC/104-*Plus*, and PCI-104. Most notably, both platforms offer flexibility and can be used as a standalone system or in a stack with other expansion boards. In addition, both platforms are appropriate for deeply embedded applications where long-term availability and high-reliability are crucial. Nevertheless, despite the synergies, there are compelling arguments for selecting one platform over the other. The decision is generally a function of available space (“real estate”) and system requirements. Lesser considerations include targeted application and maintenance concerns.

OVERVIEW

PC/104 was standardized in 1992 under the auspices of the PC/104 Consortium and enhanced in 1997 when the Consortium launched PC/104-*Plus*, which added PCI to the basic architecture. That addition allowed 8- and 16-bit PC/104 boards and 32-bit PC/104-*plus* boards to coexist in the same stack. It brought the benefits of the IEEE P996 PC standards into the realm of a very small form factor, 3.6 x 3.8 inches, and it did so in a unique stackable board architecture that eliminated the need for backplanes, card cages and chassis.

EBX in turn, introduced a larger motherboard specification to the embedded community (See Fig.X) but one whose form factor, at 5.75 x 8 inches, was still substantially smaller than the smallest commercial standards--whether the original 12 x 11-inch AT standard or the newest 8 x 10-inch NLX standard of the time. Moreover, EBX provided more compact and reliable expansion than the commercial standards with their edge-card add-ins, connected perpendicularly to the motherboard or in parallel using a riser card. The expansion medium called out by EBX was the industrial-strength PC/104-*Plus*.

Nearly a dozen vendors offer EBX motherboards and the board-level offerings from the 80-member-strong PC/104 Consortium number in the hundreds, with almost 40 members fielding CPU boards alone.



DIFFERENCES

Available Real Estate & System Requirements Drive Platform Selection Process

Based on the same IEEE P996 and PCI standards as PC/104-*Plus*, EBX has one critical difference: available real estate. The EBX form factor has almost three-and-one-half times the real estate of PC/104 and PC/104-*Plus*.

By way of comparison, consider two nearly equivalent VersaLogic CPUs: the EBX-size VSBC-8 and the PC/104-*Plus* Jaguar. Both utilize a Socket 370 Intel microprocessor with a range between a low-power 350 MHz Celeron and an 850 MHz Pentium 3. In the Jaguar, essentially all of the (South bridge) system I/O resides on a second, lower board (See Fig.X.), with the upper (North bridge) processor board containing memory and a graphics chip. In sharp contrast, the Socket 370 EBX SBC has sufficient real estate to accommodate all of the functionality it takes two PC/104-*Plus* boards to provide. Moreover, the EBX alternative is equipped to pack even more functionality into its 46-square-inch profile. The available real estate afforded by the EBX allows an audio function, 2 additional COM ports, an Opto-22 interface, an analog input option and an additional IDE channel that are lacking in the Jaguar.

The increased real estate of EBX is a double-edged sword. On the one hand, its dimensions make it unsuitable for severely space constrained applications, where PC/104 or PC/104-*Plus* may provide not just a viable solution but the only standard with a format that physically fits. On the other hand, for those systems that can accommodate the dimensions, EBX will almost always represent a lower cost solution because of the greater functionality it can accommodate. The bottom line is that a PC/104 or PC/104-*Plus* equivalent to an EBX board is frequently a two-board solution, with added cost factors based on PCB materials, extra connectors, additional assembly costs, etc.

Targeted Applications & Maintenance Concerns

Beyond the basic differences of real estate and cost, there are few other significant issues in comparing PC/104-*Plus* and EBX, but some subtle considerations can sometimes come into play. For systems that require a number of stacked plug-in modules, for example, a standalone PC/104-*Plus* stack can provide a much more physically robust implementation than EBX with PC/104 or PC/104-*Plus* plug-ins. Several vendors provide off-the-shelf chassis for building very rugged PC/104 and PC/104-*Plus* systems. When properly housed, a standalone multi-stack PC/104 system is both compact and extremely rugged. Providing the same level of ruggedness for a module stack that resides on top of an EBX motherboard, on the other hand, would be either extremely difficult or very expensive.

Regarding system maintenance, the EBX alternative appears to have an edge over standalone PC/104-*Plus* systems. With multi-module stacks, it can be fairly complicated to get at a particular board that needs servicing or replacement. By virtue of the higher real estate and functionality of an EBX baseboard, a system is likely to need fewer



expansion modules than if it were a standalone PC/104-*Plus* stack, somewhat simplifying the issue.

FUTURE

Today, EBX coexists quite nicely in the marketplace with PC/104 and PC/104-*Plus*, often within the same categories of applications. As discussed above, there are compelling reasons to select one platform over the other, primarily related to available real estate, cost, and system requirements. As technology continues to drive down component size, increased functional density will expand the application range of the PC/104 family and the EBX platform becomes “over-sized” for many applications. This opens the door to a form factor somewhere between the 13.68 square inches of PC/104 and PC/104-*Plus* and the 46 square inches of EBX. Perhaps that time is now.