

Recessed enclosures provide unique protection for your system design

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Many signal processing, analytical, and diagnostic instruments are utilizing Eurocard-based enclosures that are recessed. With higher signal frequencies and lots of cabling, the incentive to recess an enclosure continues to increase for many applications. There are many benefits to this type of design and with a modular enclosure construction, the barriers are minimal.

Eurocard enclosures

Eurocard is a standard, common format for PCB and subracks. The height increments increase by units of 1U (1.75"), widths of HP (horizontal pitch) of .20" and a depth of 100mm with each increment at 60mm (160, 220, 280, etc.) Eurocard allows a modular, standardized format to be used as the basis for a unique design. The standardization significantly reduces development costs, reduces time to market, and allows a wide range of potential suppliers to offer to standard or "modified-standard" solutions.

The modular Eurocard subracks typically use extrusions which can be cut into any length. The extrusions may have handle "teeth" that allows cards to be plugged/latched in various pitches and tapped strips where panels or other components can be mounted. They also accept the side panels, covers, mounting screws, etc for a modular design.



Recessing a Eurocard enclosure can be achieved with the modular construction usually via some modifications to the lids/panels and placement of the subrack. With the extruded rails and holes in regular intervals for mounting, it is easy to be flexible in the depth the card cage is recessed. Sometimes, the recessed amount is only 30-60mm for all of the plug-in boards to be enclosed within the four walls of the enclosure. Other times, the depth will be a few inches so that front cabling can be re-routed or special devices are well protected in the confines of the chassis. See Figure 1 for a side view photo of a recessed chassis.

EMC and board protection

There are a lot of solutions for EMI/RFI protection in an enclosure. Gasket strips, stamped EMC tabs, and other solutions can manage attenuation. The recessed enclosure helps the designer start off with protection, which can be easily supplemented with the traditional shielding methods.

Another benefit of a recessed enclosure is it allows space for the plug-in boards to be fully enclosed. A front panel can be installed to enclose the chassis, with hinged options. Often, a vertical-mount 19" rackmount chassis will have less cards than fills up the enclosure. So, one portion of the front of the card cage will have a fixed front panel to enclose the part of the card cage that the plug-in boards don't fill. With a modular design, the tapped strips within the extruded rails allow any 1HP increment front panel to be screwed into the chassis. So, it is easy to have an EMC panel in various sizes help enclose the chassis and provide some EMC protection. The outer hinged front panel provides additional protection.

Another nice benefit of the outer hinged front panel is it can have a keylock attached to secure the unit. This can be important for any type of application where security of the system is important. Finally, with the unit fully enclosed, it helps prevent any accidental damage from being bumped, something falling onto the front boards, something hooking onto the cables on the front boards, etc.

More design considerations

When implementing a recessed enclosure, there are some considerations. Of course, the outer opening needs to be a bit larger than the card cage area. Otherwise, the cards would hit the outer rails. It also helps to have enough space for one's fingers to fit inside the enclosure enough for ease of board insertion/extraction.

Designers should also consider the amount of space they may want for cable routing. Often a few inches are needed for the front cables. With enough front recessed space, front cables can be routed back to the rear of the chassis. If there is rear IO, the proper spacing of the side walls and subrack distance needs to be calculated to account for plugging of both the front and rear boards.



Horizontal-

mount versions

Chassis in horizontal-mount configurations can also be recessed. For Eurocard-based architectures like CompactPCI, VME/64x, and VPX, it usually consists of a 6U board mounted horizontally next to the front-pluggable PSU. This allows full swappability of the system and minimal downtime. Naturally, many of these applications are also looking for recessed solutions. Figure 2 shows a horizontal-mount version with a hinged front panel for a 4U CompactPCI solution.

MicroTCA is another form factor that often comes in a horizontal-mount

configuration. The single width modules are a little under 75mm wide. So, multiple modules are plugged side-by-side in a card cage for the power modules, MicroTCA Controller Hub (MCH), and AMC modules. In a recessed configuration, the entire card cage can be drawn back within the outer enclosure. In many MicroTCA based applications, the system is provided as a complete appliance with the chassis and all of the modules included in a complete solution. However for recessed applications, there are not standard configurations for the appliance. So, working with an embedded enclosure specialist for the enclosure portion is especially important.

Rear recessed

Many embedded systems have rear IO options, where the chassis complies with IEEE 1101.11 mechanical mounting specifications. As the concept is basically the same for an extruded modular chassis in the rear as the front, the rear of the chassis can also be recessed. It is also possible to have some modules recessed within the card cage and others flush with the rear (or front) of the chassis. You just need to provide the proper mounting provisions.

Increasingly popular

There are many advantages to utilizing a recessed enclosure. This includes EMC, safety/security, cabling, and mechanical protection. One barrier in the past was the concern that too much customization would be required. However, with a modular construction the changes can be implemented with less modifications. As more recessed chassis configurations become available, less modifications are required in the future. Who knows, perhaps we'll see recessed enclosures become much more common for embedded systems.

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