

WHITE PAPER

How to Modify Enclosures to Get the Design You Need for Less Time and Cost

With a little planning and coordination, you can get your design to market faster, with exactly the enclosure it requires. Our white paper includes tips that will speed and simplify the enclosure modification process.

What distinguishes a simple metal or plastic box from a functional electronic enclosure? Most often, it's the modifications necessary to allow access to the interior, stabilize and protect its contents, and present the appropriate appearance. Enclosures typically need a minimum of one cutout for a power cable and often many other modifications, which can include holes, cutouts, tappings, gaskets, pre-assembly, and finishing.

For many design engineers, specifying enclosure modifications is the final step in the design cycle, with time-to-market pressure leading many to demand 1-2 week delivery rather than the 3-4 weeks common in the past. Although enclosure suppliers can typically turn around modifications in 10 to 15 days, the most efficient ones can complete simple modifications in as few as five days with no charge for expediting. With a little planning and coordination with the right supplier, product designers can get their creations to market faster with exactly the enclosure their design requires. Here are a few tips that can speed and simplify the enclosure modification process:

Identify your enclosure modification needs as you create your product design

If you figure out your enclosure requirements early, you'll often be able to take advantage of a stock enclosure, which will cost substantially less and require far less lead time than a custom one. For example, with extra planning time, you have the flexibility to reposition the mounting screws on the PCB to line up with a stock enclosure's mounting bosses or you might select taller keys to accommodate a standard box's depth. Enclosure suppliers can easily mill out a mounting boss or card guide that's in the way or add tapped inserts to increase the stand-off to allow mounting the PCB closer to the front of the enclosure.

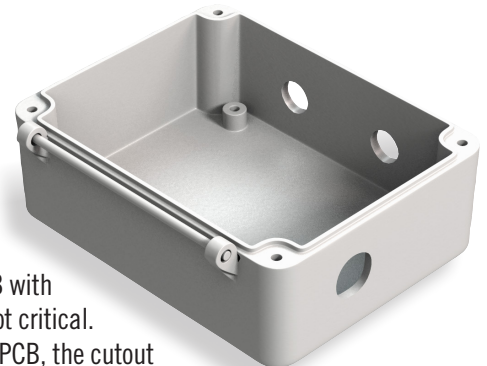


Find a supplier with a wide selection of sizes in the enclosure style you prefer

Standard sizes are almost always less costly than custom ones. If you select the right enclosure, some modifications may not be necessary. For example, a polycarbonate enclosure with a clear lid eliminates the need for cutouts for LEDs and displays. Sheet metal boxes are formed by bending metal, so the additional cost for a custom dimension may be within your budget, but a custom plastic enclosure entails significant molding charges and long lead times. Look for suppliers who have invested in tooling, can produce modifications rapidly, and are equipped to accept customer CAD files.

Make sure you know where the cutouts need to be and what tolerances are acceptable

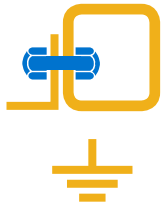
Some components, such as a switch, may be connected to the PCB with a flexible cable, in which case the exact position of the cutout is not critical. However, with a component like a data port that's mounted on the PCB, the cutout must be positioned precisely in relation to the PCB mounting bosses. Tolerances depend on the precision of the equipment used, so ask the supplier of your components to verify the product's tolerances.



so that the enclosure supplier provides a turn-key modification for you. Remember that two holes can be within tolerance and still not fit your design. If one hole is offset slightly to the left and the other is offset slightly to the right, the combined distance may be significant. Inform your supplier which cut has the most critical tolerance so the other cuts can be made in relation to it.

Other considerations

To streamline your modifications order, keep in mind the following considerations:



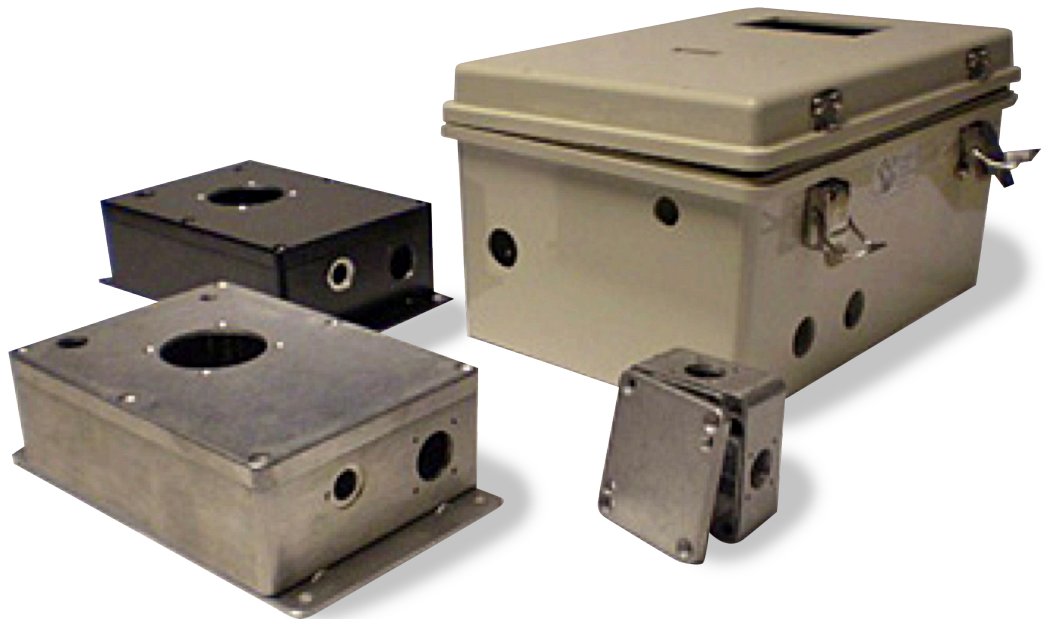
- **Mounting.** Are internal or external mounting provisions required? Your supplier may be able to add tapped holes or preassemble mounting brackets.
- **Grounding.** Will certain areas or enclosure components need to be masked for continuity? Are ground points or studs needed? Suppliers can address these needs for you.



- **Draft angles.** Cast boxes typically have a 1-2 degree taper, which enables the casting to be removed from the mold. This angle may affect mounted components, and should be taken into consideration when making modifications.



- **Wall thickness.** Some components have a minimum wall thickness that they can mount to or a maximum wall thicknesses through which they can be mounted..



Take advantage of services that you would otherwise have to perform in house

Most enclosure suppliers offer pre-assembly of enclosure components, including cable glands and mounting brackets. Most will also apply decals and custom labels for easy shipment to your customers.

The same is true of racks and cabinets. Rather than assembling custom components in house, it can save production time to order them pre-assembled. Locations of access panels, custom shelves, fans, vents, lock hasps, power strips, casters and levelers must be carefully specified. If a component needs special EMI protection, then the supplier can mount a die-cast aluminum box on the rack.

Consider how a custom color could help differentiate your product in the marketplace, which could give you an edge in markets where competing products all appear similar. Many suppliers offer enclosures with a powder-coat finish.

Carefully weigh the pros and cons of making enclosure modifications in house

The break-even quantity for saving money by making modifications yourself is around 50-100 pieces, but it also depends on the type of modification you need and the capabilities you have in house. If all you need is a drill press, it's probably doable, but if you also have to pull a worker off the shipping dock to run it, make sure to factor in the cost of not shipping for a few hours or the cost of overtime. Other modifications, such as silk-screening or painting, require equipment you probably don't own.

Many OEMs considering handling modifications in house don't know they shouldn't use the same drill bit for metal, plastic and fiberglass, and they're unaware of the torque speed required to cut a polycarbonate box without cracking it. Therefore, if they absolutely must do modifications in house, they should plan for a certain amount of scrap. On some projects, the cost of modifications at the supplier will be just a fraction of the cost of scrapping an enclosure.

How to work with your enclosure supplier

Here's what's involved in working with an enclosure supplier to handle the modification process. First, download the DXF drawing from the supplier's website, then import it into your CAD software and indicate where the modifications should be located. The supplier will work from your file. The vendor will then use its expertise to verify your design and ensure that it will perform as anticipated.

Having the enclosure manufacturer make the modifications is usually the most economical decision. Order in the largest quantity that makes sense to minimize cost. On an automated milling machine, the run time is only 30 to 60 seconds per enclosure; setting up the machine takes the majority of time. Robotic equipment can modify multiple box sides with only one setup. Although job shops may more cost competitive on shorter runs with just one setup, OEMs will incur extra freight costs and shipping time, and must deal with multiple suppliers.

Free yourself to focus on the important stuff

Enclosures are part of the design and should not be left as an afterthought. Once product designers discover the ways that their suppliers can modify a stock enclosure, they have the freedom to focus on more critical parts of their jobs, reduce costs, and get products to market faster.