How it works

Although each project is different, all StdBx designs use a common architectural structure to fit into the enclosure. A cross section diagram of the structure shows how the parts work together.



The design starts with a PCB that has the user interface components (buttons, switches, displays, connectors, etc) mounted to it. In front of the PCB is the front panel that protects the PCB components and provides the surface for labels. There is a library of common components that the designer can choose from. Each component in the library was chosen so that it looks and works well with the structure. The PCB and the panel are separated by threaded spacers and are captured and held in place by channels in the enclosure.

The front panel is designed as a sandwich of three layers.  I call these Epi, Reveal and Diffuser.  The top Epi layer is always clear with cutouts for controls or connectors that protrude through the panel.  The middle Reveal layer is opaque with cutouts for protrusions and labels.  The bottom Diffuser layer is translucent.  It has cutouts for protrusions and things like displays that should not be blurred.



Without backlight the Diffuser layer enhances the contrast of the cutouts in the Reveal layer.  With backlight the labels or indicators cut in the Reveal layer light up.  In terms of laser cut plastic there are actually just two pieces that are fastened together when mounted in the enclosure.  The Reveal layer is bonded to clear acrylic (i.e. 2-ply acrylic).  This is so that letter interiors don't fall away as part of the engraving process. When the Reveal layer is engraved away, it leaves the surface of the acrylic rough making it translucent rather than transparent so it can act as the Diffuser layer.

Here’s another cross section example.

<display section>

In this case a graphical display is mounted to the PCB. There is a cutout in the Reveal layer so that the backlit LCD shines through. There is also a cutout in the Diffuser layer so that the display is not blurred. Note that there is NOT a cutout in the clear Epi layer so the display is protected. Also, the Reveal and Diffuser layers are not exactly the same size making for a bezel around the display that dresses it up.

Here is another way to look at it. The lines in each of the Epi, Reveal and Diffuser layers define cutouts for that layer. Lines in Epi and Diffuser cut all the way through. Since Reveal and Diffuser are bonded together we cut through the Reveal layer using engraving. A side-effect or caveat is that since cutouts in the Diffuser layer cut all the way through, they are automatically cutouts in the Reveal layer. Watch out for this if you are designing your own components.

All the components in the StdBxLibrary have Epi, Reveal and Diffuser layers defined for the specifics of that component. The engraving and cutouts in these layers along with the PCB layout information and the mechanical characteristics have all been chosen so that they fit with the spacing between the PCB and the front panel as well as the thickness of the front panel.

When you place a component from the StdBxLibrary onto your PCB you are also placing that component’s Epi, Reveal and Diffuser definitions. Placing the “SERIES\_100” (SB0002) component has the added function of defining both the PCB and the front panel outlines.

When you run the ULP with the StdBxCAM file, you cause Eagle CAD to output two files that the laser cutting service can translate into commands for the laser. One file is for the front panel Top piece. The other file is for the 2-ply front panel Bottom piece.

An alternative construction, that is more expensive but looks a little better, uses separate pieces of acrylic for the Reveal and Diffuser layers.

