



## Panel Fiducial Requirements for Processing

1. We prefer fiducials as bowties or inverted bowties. Cross hair fiducials are acceptable with a line-width of 5 to 10 mils.
2. For copper layers, we recommend fiducials with a diameter of no greater than 0.080". This size should prevent the fiducials from flaking off in any skiving process. See Figure 1 for an example.
3. We need four-point alignment, with one fiducial offset or out of rectangular formation (to ensure proper panel orientation) by at least 0.050". When panel is viewed from the opposite side, a fiducial should shift position. See Figure 1 for an example.
4. All fiducials are ideally (0.500", 0.500") or greater from the edge of the panel.
5. All tooling holes should be indicated in the file(s).
6. For a flexible material, panel shrink and stretch can induce positional error for the part. Etching a feature close to the active area or image on the panel can reduce scaling / positional error. This visible feature gives an easy target for alignment.
7. Indicate the top and bottom layers using tooling holes, chamfered corners, or some other feature.
8. For multi-layer stack-ups and drills, the fiducials should all be shifted from layer to layer, so that no two sets of fiducials are stacked atop each other. Layer-specific fiducials shifting helps us verify both the layer/side of the panel being processed and the layer being aligned to. For example, the fiducials for layer 2 should be in a different location than that of layer 3. If fiducials are stacked, the top fiducial will be lost when exposing the subsequent layer's fiducial. See Figure 2 for an example layout.

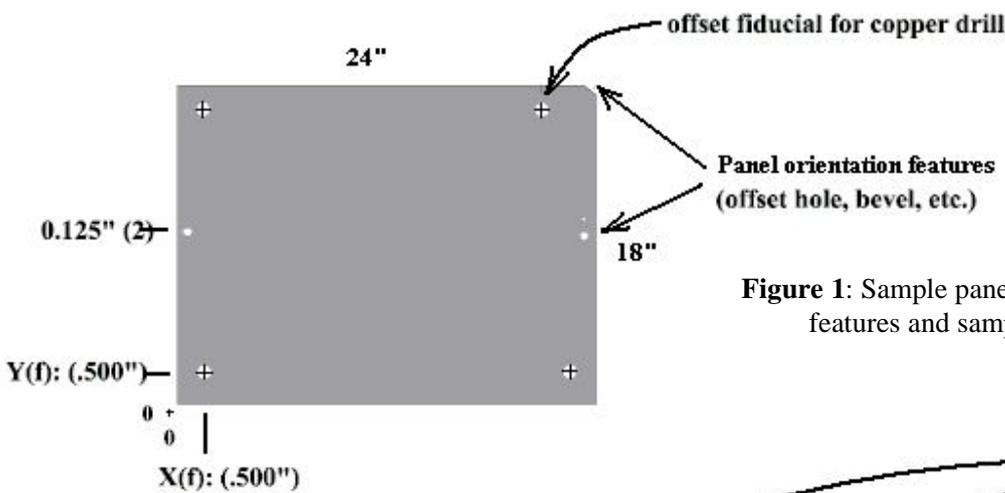
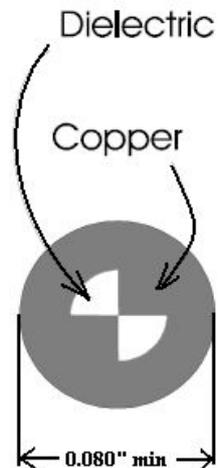


Figure 1: Sample panel layout with orientation features and sample bowtie fiducial

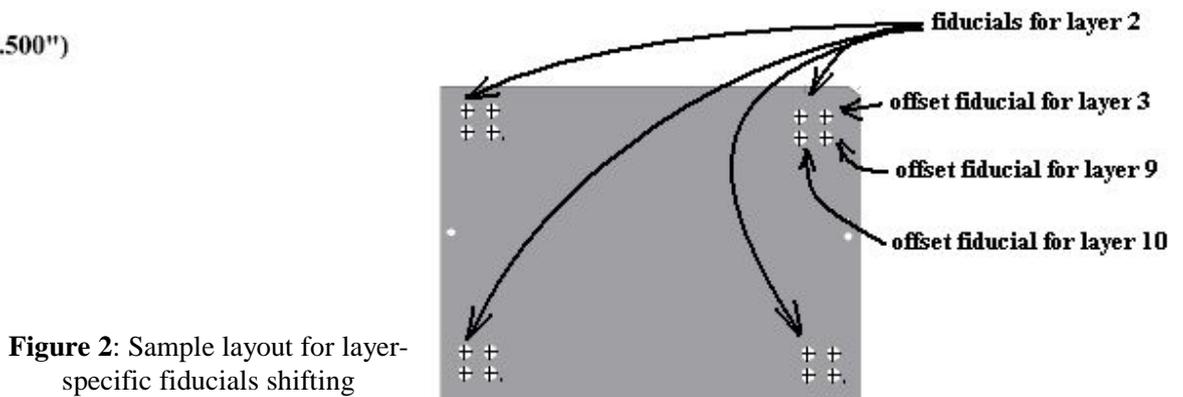


Figure 2: Sample layout for layer-specific fiducials shifting