

GENERAL DRILLING, TRIMMING, AND FASTENING INSTRUCTIONS FOR ACRYLIC WINDSHIELDS AND WINDOWS

DRILLING

There are just a few general principles that must be understood to successfully drill acrylic:

- **DO NOT** use a standard wood or metal cutting drill bit. You will risk cracking and chipping the material. These bits will pull into the material and will bind as they exit, cracking and chipping. Successful holes have been drilled with a standard bit, but the risk is extremely high. Drill bits need to be reground to have a 0 degree rake on the cutting edges. They scrape a hole instead of cutting, and will not bind or pull upon exiting the material. If for any reason you elect to use other drill bits, be sure to modify the bit so that the cutting edges have a 0 degree rake angle.
- **DO** use very light pressure when drilling with acrylic drill bits. It is possible to crack or chip the material by forcing the bit with too much pressure. For instance, when drilling a vertical hole, the weight of the drill is all the pressure that is needed. Be patient and give the bit time to do its work. You should see just fuzz coming from the bit - if the bit is pulling spirals from the material, you are using too much pressure. Use higher drill speeds on small hole sizes, and slower speeds as the hole size is increased.
- **DO** drill oversize holes. Acrylic will expand and contract at different rates than fiberglass, so oversize fastener holes are required to allow for movement. The general rule is drill a hole at least one and one-third the diameter of the fastener. In most cases a grommet will be used, whereupon the hole size is the grommet interior ID.
- **DO** drill larger holes by step-drilling starting with a smaller size bit. About the largest size hole you can drill easily in one step is 1/4 inch.
- **DO** use a countersink to chamfer the shoulders of all holes. Any sharp edge tends to be a stress riser, so break all sharp edges. This also applies for all window edges. You can use a sanding block and a fine sandpaper (150 grit or finer) to finish the window edges.
- **DO** practice on the old window or a scrap piece of acrylic material.

TRIMMING

As in drilling and fastening, there are a few rules to follow when trimming:

- **DO NOT** use any type of reciprocating saw, including hand saws or saber saws, to trim acrylic windows. The only safe saw is a band saw with a fine-toothed blade (1/4" or 3/8" wide rake blade with 14 or more teeth per inch). A band saw blade travels in one direction only and runs cool. A reciprocating blade, even a hand saw, will build up heat and bind, quickly cracking the acrylic.
- **DO** use a sander to trim windshields and windows. A 4 1/2" angle grinder with an 80 grit sanding disk works well. This tool is easy to control with one hand and will remove material quickly. A belt sander is also a good choice. A small rotary tool is very versatile and may be fitted with a small cutoff blade for trimming or it may be fitted with a drum sander for cutting notches and working in small areas. Care should be taken, however, to keep the tool from binding when using a cutoff blade. If material needs to be removed from a straight section, **DO** use a hand planer at it's lowest setting – not only does it take material away fast but it will also keep the edge straight.
- **DO** support the part when trimming or sanding. A padded table or work bench will work well for a work surface.
- **DO** mark for trim with a china marker grease pencil or felt tip marker. These marks can be readily removed with acrylic window polish or 100% mineral spirits.
- **DO** radius and finish all edges after final trim is established. Sharp edges and heavy sanding marks tend to be stress risers in the material. A sanding block and 150 grit fine sandpaper will easily smooth acrylic edges.

FASTENING

As in drilling and trimming, there are a few general principals that must be understood:

- **DO** carefully control the torque of the fastener. Watch the reflection of a strong light in the surface of the acrylic around the screw head. Tighten the screw and nut just until you see a distortion in the surface around the screw head and then back off just until the surface is distortion free. At this point the screw and nut assembly may be able to be turned with a screw driver but probably not by hand. Since acrylic expands and contracts at different rates than the airframe, this method will allow the window slight movement.

- **DO** use grommets and tighten until the grommet begins to mushroom from under the finish washer.

- **DO** watch for anything that could cause localized stress in the material. Mounting over a bolt head, for instance, will cause a lot of stress in that area, and will probably crack when adjacent screws are tightened. Watch out for raised weld beads, sharp corners, etc. If necessary, bridge the window over the obstruction using washers as spacers, or remove the obstruction.

Drilling, trimming for fit, and fastening acrylic windshields and windows is not difficult, you just have to understand the material, the tools required, and the proper methods. With a little practice and a little time to get the feel of the processes, you will have a very satisfactory installation with a long service life.

STORAGE: DO NOT ALLOW THE WINDSHIELD OR WINDOW TO BE EXPOSED TO SUNLIGHT WITH THE PROTECTIVE COVER APPLIED. EVEN SHORT EXPOSURE WILL MAKE THE COVERING VERY DIFFICULT, IF NOT IMPOSSIBLE, TO REMOVE.