Dress up your favorite electronic project by designing and building a customized plastic enclosure that will fit it like a glove

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Build Your Own Custom Cases

So you've just finished that special project and you are proud of the way it works, but it has an odd size printed-circuit board and now you need an enclosure in which to house it. Since you've spent a lot of time designing and building the project, you want an enclosure that will dress up its appearance. Leafing through parts catalogs you turn up a variety of enclosures—some that are either too long, some too wide, others too tall, or too expensive.

Under most circumstance, you usually have to settle for a larger enclosure that fits your project like a marble fits in a shoe box—oh well, at least its within your budget. But have you ever thought about producing your own custom-fitted project enclosure? Such an enclosure can add a lot of eye appeal to your project.

What's Needed. Making your own plastic enclosures can be just as enjoyable as building the project itself, and doing so is easier than you may think. The three ingredients that go into producing your own enclosure are the materials (plastic-sheet stock), the tools (basically, a few wood working tools), and the "know how" (which we'll supply). The plastic-sheet stock needed to produce small enclosures is fairly inexpensive and easy to find. Checking the yellow pages of the phone book will turn up retail plastic-supply stores that will even cut your pieces to size. Many stores will even make your enclosure for you, for an additional charge.

The plastic-sheet stock comes in all thicknesses and colors. It also comes in rods, square bars, and tubing of all sizes. Acrylic cement and applicators, special drills, and just about anything else you'll need to work with plastics are usually available at the plastic-supply house, and many of them even provide a catalog of stocked items.

Few tools are needed for working with plastics and you may even have them already. A small table saw with the correct blade is a basic tool needed for cutting plastic sheet stock. In order to cut plastic smooth enough for joining, a special blade is required. An 8- or 8½-inch carbide, fine-tooth blade with a minimum of 60-teeth per inch is needed. The blade should have all the teeth evenly spaced with little or no set. Such blades are often used for cutting aluminum or copper and can be found in most hardware or tool-supply stores.

The rest of the tools needed are minimal; small coarse and fine flat files and some medium-grade sand paper.

What Size Enclosure? The most rudimentary element of enclosure fabrication is knowing what size enclosure is required. It may seem silly to make such a point, but a great deal of plastic can be turned into scrap by ignoring that simple principle. A basic enclosure consists of six parts: the top and bottom, and two sides and two ends. The sides and ends (as shown in Fig. 1) are glued to the bottom, and the top is removable.

A simple but effective way to determine the length and width of the enclosure is to take the size of your printed-circuit board, add to that the thickness of the two sides and end pieces plus the clearance needed for the additional plastic parts used for attaching the lid to the enclosure (more on that later). That gives you the overall size of the top and bottom pieces. The side and end pieces are cut to the height, as determined by the parts to be housed, needed for your project. Be sure to allow ample space for any off-

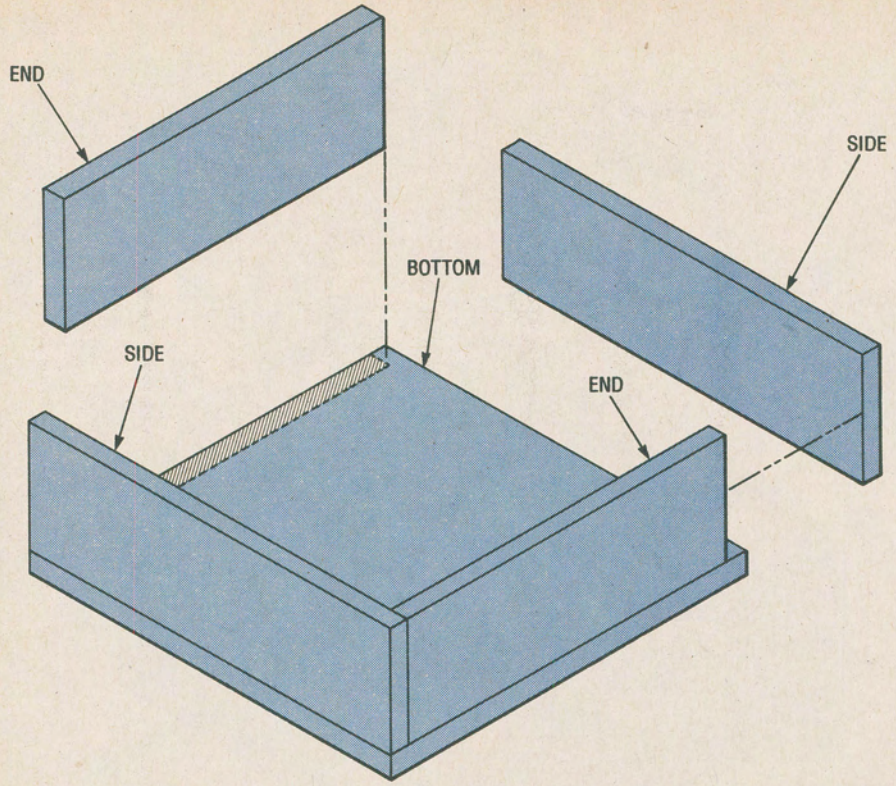


Fig. 1. A simple enclosure consists of six parts: a removable top and a stationary bottom, two sides, and two ends.

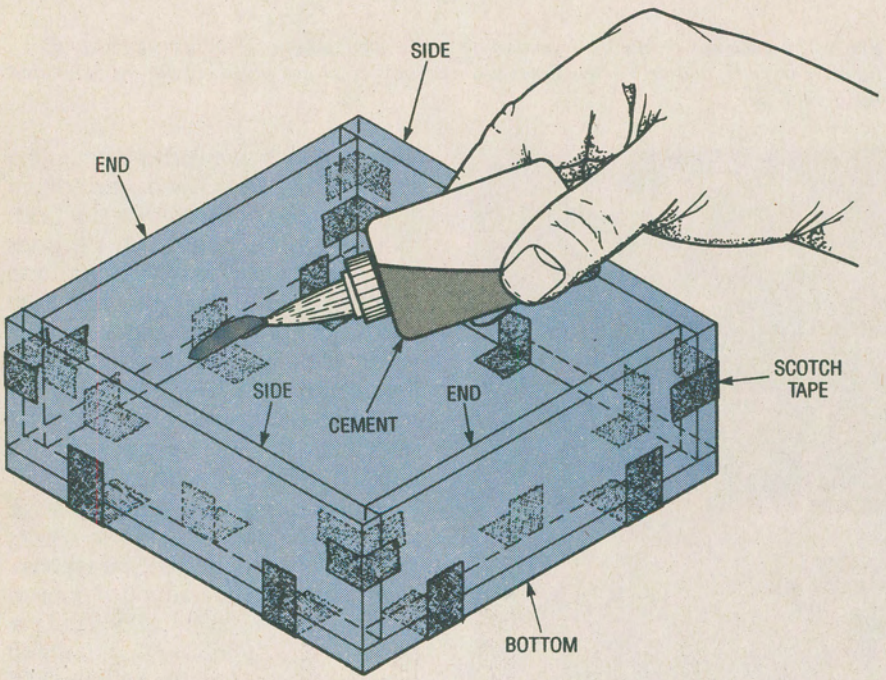


Fig. 2. Once you have all the parts cut, tape the sides, ends, and the bottom together, making sure that all the joints are tight and square. Then use liquid-acrylic cement to make the joints permanent.

board components, including a battery holder if used.

Building The Enclosure. Once you have all the parts cut, tape the sides, ends, and the bottom together with Scotch tape, making sure that all the joints are tight and square. Use the tape wherever it is needed to make a good, tight joint. When the enclosure is taped correctly, it will be surprisingly sturdy (see Fig. 2). Acrylic cement, in liquid or paste form, is available from plastic-supply stores.

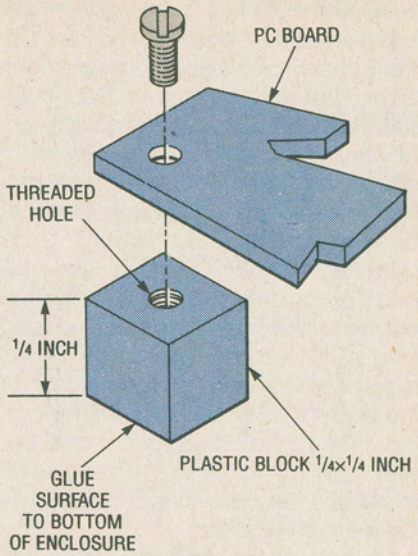


Fig. 3. Printed-circuit mounts can be added to the enclosure by first screwing 1/4-inch square scraps of acrylic to the board, applying a little acrylic cement to the bottom surfaces of the acrylic squares, and placing the assembly in the desired location within the enclosure.

Because paste-type cement must be applied to the edges and narrow surfaces of parts before they are joined, it is not suitable for this application. The liquid form is easily applied with an applicator bottle that has a long metal capillary tip that can reach into corners. A plastic, disposable hypodermic needle makes a wonderful cement dispenser.

The liquid cement has the consistency of water, so when the cement is ap-

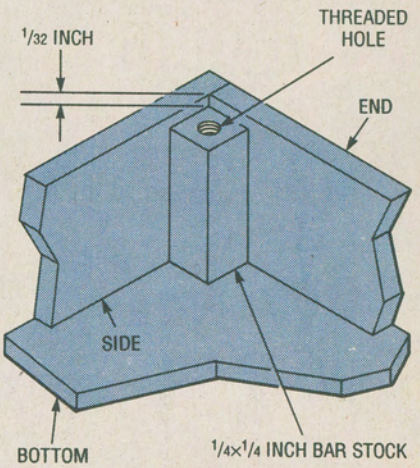


Fig. 4. One way to handle lid mounting is to cut 1/4-inch square bars of acrylic to about 1/32-inch shorter than the height of the sides. Cement the four pieces into the four corners of the enclosure. Once dry, place the lid on the enclosure and drill screw holes through the lid and into the lid mounts.

plied to the joints, capillary action will take the cement between the joint. Do the bottom joints first and allow about 30 minutes or so before handling. After sufficiently dry, place the enclosure on its side, do the lower two corners, and allow to set. Once the side joints are dry, flip the enclosure to the other side and complete the other two corners.

Use the cement sparingly, with just enough liquid to go into the joint without running over the flat surfaces or running out the back side of the joint. Liquid cement will etch the surface of the plastic if left to dry; any cement that is outside of the actual joint should be wiped off quickly. A little practice will make you very proficient at applying just the right amount.

Once you have the basic enclosure and the separate lid, the next thing that is needed is a way of mounting the printed-circuit board to the bottom of the enclosure and a way of attaching the lid to the enclosure itself. Making small pads on which to secure the board to the enclosure is one method for mounting the board. Cut four small squares of ¼-inch thick scrap acryiic to about ¼-inch square, see Fig. 3.

Use a #43 drill bit to make a hole in the center of each piece and tap the hole for a 4-40 thread. Mount the pads to the bottom of your circuit board with

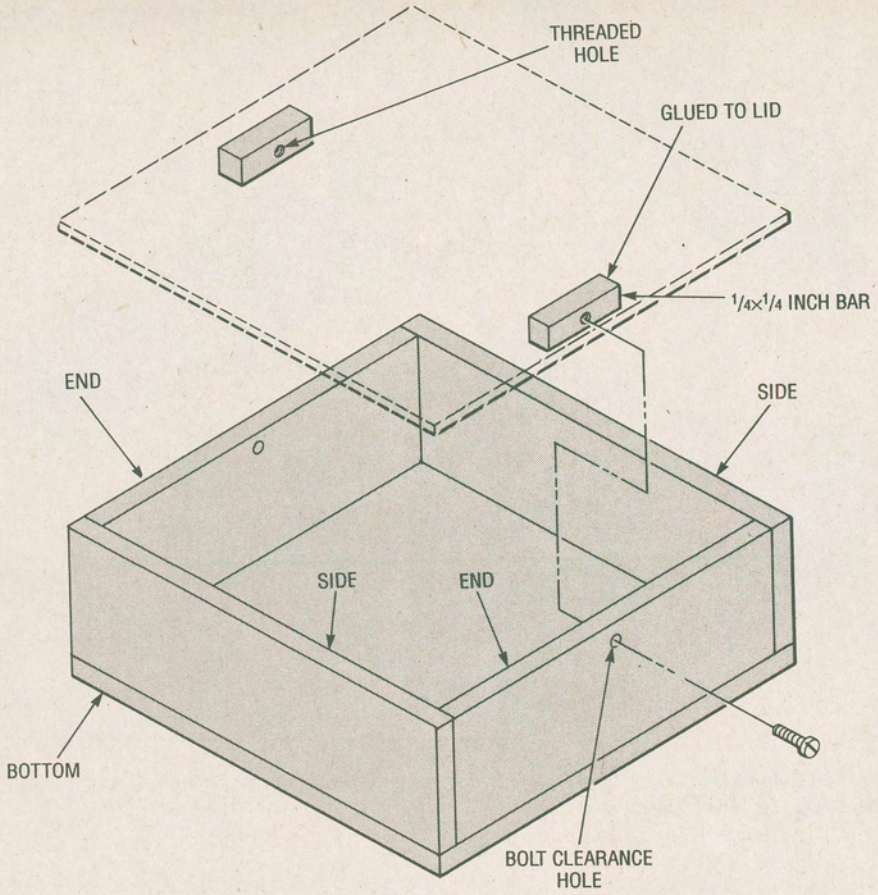
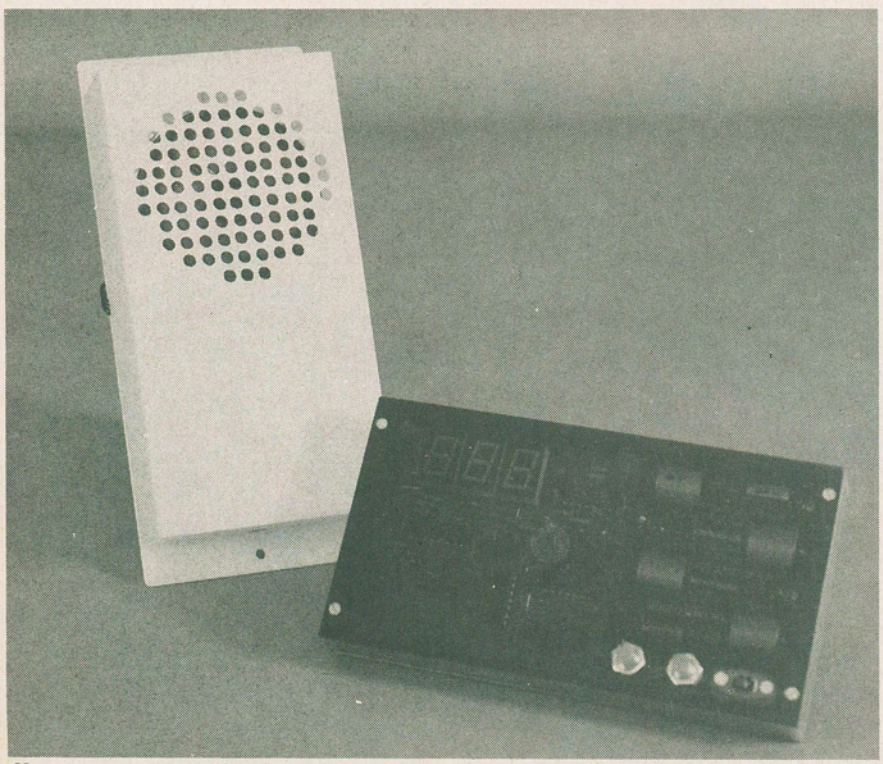


Fig. 5. Another way to handle lid mounting is to cement lengths of an acrylic bar to the lid on both ends, and drill screw holes through the side or end panels of the enclosure and the acrylic bar.



Here are two custom fitted project enclosures. The one to the left has a perforated speaker area near the top; the other has its front panel made of tinted translucent acrylic eliminating the need of a cutout area for the display.

4-40 × ¼ inch screws making sure the screws do not extend below the bottom surface of the pads. With all four pads mounted to the board, wet the pads with cement and set the board into your enclosure where you want it. To ensure a tight bond, place a little weight at the center of the board while the cement dries. After 30 minutes, the screws and PC board can be removed and the pads will be permanently bonded in the desired location.

Mounting the lid is easy, however, since plastic parts needed to mount the lid are located inside the enclosure. You'll need to decide on your mounting scheme before you layout and cut the enclosure parts. One way to handle lid mounting is to cement four lengths of a ¼-inch square bar, cut to about 1/32-inch shorter than the height of the sides, into the four corners of the enclosure (see Fig. 4). Then just put the lid in place and drill a pilot hole using a #43 drill through the lid into the center of the corner pieces. Tap the four holes in the corner pieces for 4-40 screws and enlarge the holes in the lid to accept the screw.

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Another method for attaching the lid is to glue small blocks to the bottom of the lid, and drill and tap the blocks attached to the lid. Mounting screws are inserted through the sides of the enclosure into the blocks attached to the lid (as shown in Fig. 5) to hold the lid panel in place.

After the enclosure is completed, allow about 24 hours for curing and then carefully file off any rough edges and protrusions. The sharp corner edges can be beveled using a fine-grit sandpaper.

Any plastic battery holders, which are available for all battery sizes from "N" cells to "D" cells, can be cemented to the inside of the enclosure with fast-curing epoxy. Lightly sand the bottom surface of the battery holder and the place where it is to be mounted. That gives the epoxy a better gripping surface. To complete the enclosure, stick-on rubber or plastic feet can be applied to the bottom corners.

This And That. Working with plastics, you will find that new designs for those special projects can be made easily with just a little thought before actually cutting the parts. It's always a good idea to "build" the enclosure on paper first to avoid unpleasant surprises. It should be noted that the specified thickness of plastic sheet is not always true. For instance, an eighth-inch thick sheet may vary as much as 20%. To avoid problems from thickness tolerances, purchase enough of the plastic sheet to make all the parts from the same piece. The piece can then be measured and the dimensions of the enclosure adjusted to take into account variances in thickness.

An extra advantage of the plastic enclosure is that it can be made using colored plastic, so that the finished enclosure doesn't need painting or finishing of any kind. And if your project has a digital readout, the entire top panel can be made of translucent plastic so the readouts can be seen without the need of a cutout window.

Small holes for wires can be drilled without too much pain using standard drill bits. And there are bits designed specifically for plastics work, which have long tapered tips (similar in shape to a tapered reamer), and will not grab as it goes through the sheet. ■