

Fiberglassing (on a budget) 101

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Fiberglass enclosures can be beautiful works of art, and they can sound great too! Knowing how to fiberglass can generate large amounts of income for you, or just make you a better, more rounded mobile electronic installer/fabricator.

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(Click to Enlarge)



Intro:

To explain fiberglass technique, we will be going through the process of fabricating a basic 10" enclosure. We are going to use 5/8" particleboard for the base of the box, and a 3/4" MDF speaker ring, which may be purchased from the [Able Audio Store](#). If you have the extra cash laying around to purchase all of the expensive, non-needed tools, have at it, this tutorial will work great for you also. But for those out there who do not want to spend an extra \$800 to complete one enclosure that will only save an hour or two anyway - this tutorial will helpfully give you more options and better ideas. For those of you who do not know, fiberglassing can get very messy. Try to cover the area you are using in a plastic sheet, or do this somewhere that is not going to get messed up by resin.

Symbols:



For those who wish to save some money on their fiberglassing, pay close attention when you see this symbol.



For those of you who wish to save time on your projects, take note when you see this symbol.

Supply List:

We have tried to assemble a list of tools supplies that are necessary when fiberglassing, a picture and description so you have an example of what to look for when purchasing them, and we have tried to give a few brand names and where to purchase the items. The fiberglassing process can be confusing enough for the first-timer, we are trying to lay out everything you need so this goes as smoothly as possible for you.

Supplies			
Supply	Picture (Click to Enlarge)	Description	Place to Purchase
Wood		MDF or particleboard can be used in the construction of fiberglass enclosures as a base or the box or speaker rings. Usually 5/8" or 3/4".	Buy at Home Improvement Stores
Speaker Ring(s)		Usually made of MDF from 1/2" to 3/4", these speaker rings are needed to secure the subwoofer or speaker in place. You can not screw the subwoofer directly into fiberglass and expect it to hold.	Able Audio Buy Here
Dowel Rods		Dowel rods are hot glued (or otherwise) to secure the speaker rings in place until the fiberglass sets (hardens).	Buy at any Hardware Store
Polyester Fleece		Fleece is a soft, thick fabric used to stretch over your rings and soak with resin. It holds the rings in place while you take out the dowel rods and add layers of fiberglass mat or cloth to the enclosure for strength. White works great.	Buy at Fabric Supply Stores

Latex Gloves		<p>These are a must when fiberglassing, double up if you are working around sharp objects or corners, try not to get resin on your skin - it is a pain to get off!</p>	<p>Medical Supply Stores</p>
Resin		<p>Polyester resin is a liquid that comes with a hardener and when combined with fiberglass mat or cloth becomes very ridged. (Other types of resin include vinyl ester and epoxy, but are not needed in car audio applications)</p>	<p>Buy at Auto Parts Stores, Home Improvement Stores</p>
Fiberglass Mat		<p>This is the strength of fiberglass, this gets drenched in resin and when dry, is very ridged. Several layers are needed to get adequate strength for an enclosure.</p>	<p>Buy at Auto Parts Stores, Home Improvement Stores</p>
Fiberglass Cloth		<p>Cloth is stronger per ounce than fiberglass mat, but takes more layers to get the thickness needed for an enclosure.</p>	<p>Buy at Auto Parts Stores, Home Improvement Stores</p>
Body Filler		<p>After strengthening your enclosure with fiberglass, to smooth it out and make it look nice, use automotive body filler on the outside and sand it smooth.</p>	<p>Buy at Auto Parts Stores</p>

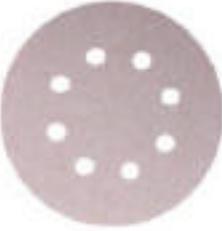
<p>Acetone</p>		<p>A chemical used to "thin" or remove fiberglass resin from tools and utensils after use and before the resin dries. Very affective in removing resin and body filler.</p>	<p>Buy at Auto Parts Stores, Home Improvement Stores</p>
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- Instead of buying dowel rods, use 1/2" or larger strips of scrap wood (mdf works great).
- Use more fiberglass mat than cloth. It builds up quicker and therefore you do not need to purchase as many packages

Tools

Tool	Picture (Click to Enlarge)	Description	Brand Names/ Manufacturer/ Place to Purchase
<p>Organic Respirator</p>		<p>Necessary for good health. This will keep the small fiberglass fibers and resin fumes from getting into your lungs.</p>	<p>Auto Parts Stores, Auto Paint Shops</p>
<p>Hot Glue Gun</p>		<p>Used to secure the dowel rods in place and the rings on top of them.</p>	<p>Craft Stores, Hardware Stores</p>
<p>Mixing Cup</p>		<p>Used to mix the resin and hardener in.</p>	<p>Auto Parts Stores</p>
<p>Plastic Squeegee</p>		<p>Used to mix and apply resin and/or body filler.</p>	<p>Auto Parts Stores</p>

Stapler		Used to secure the fleece to the speaker ring and base of the enclosure (if used). Pneumatic staplers work best if available, but they require the speaker ring to be more secure.	Hardware stores
Sander		Used to sand the finished enclosure smooth. Electric or pneumatic sanders work great, orbital is a must, DA sanders work better.	Hardware Stores, Auto Parts Stores
Sandpaper (80 through 400 grit)		You'll need roughly: 80, 150, 180, 220, 320, and 400 grit to get the enclosure ready for primer and paint - Up to 2000 grit if you want to wet-sand the clearcoat.	Hardware Stores, Auto Parts Stores

- Don't have a stapler? Use the hot glue gun to secure the fleece in place!
- Buy a disposable respirator! Doesn't sound like it will save you money? You can get a disposable for \$15 every time, instead of buying a respirator you keep in the first place and purchasing the \$30 charcoal filters. Respirators work for more than just one-time fiberglass work. Use them until you can no longer breath easily through the filters. (Read the proper instructions for use!)



Design and Setting Up:

In this tutorial, we have already gone through the decision process to choose what type of enclosure we would like, and what we want it to look like. This is a simple sealed enclosure with a fiberglass baffle.

Finished Fiberglass:



Starting Out:

First off, we have cut the panels for the base of the enclosure, glued and screwed the top, bottom, and sides together. This tutorial assumes you know how to do that. Here is where we are so far:



Click all pictures to enlarge.

Note the 'dowel rods' we are using here are nothing more than scraps of particleboard cut to length. You'll need to take the speaker ring and position it where you want it to go. Take note of about how far away from all four sides the ring is so you know about where to position the dowels. Position the dowels where they need to go and hot glue them into place. Note: this may take several attempts to get the ring exactly where you want it. It is more trial and error at this point than anything else if you did not take the time to measure out each dowel (Not many people go that route).





Got the ring in place? Good, now try to remove it. Don't take a sledge to it, just pull and push on it a bit, make sure it is good and secure. Remember that you are going to have fleece stapled to this ring pulling on it constantly, and it has to last until the resin dries completely. If you are unsure about the strength, squirt more hot glue around the dowel rods, or use more rods. The process takes a lot less time than having to re-do your enclosure because you didn't take the time to set it up properly.



- Instead of buying dowel rods, use 1/2" or larger strips of scrap wood (mdf works great).
- If you do not have a staple gun for the fleece, use the hot glue gun, it takes a bit longer, but you don't have to buy a staple gun!

Now lay your fleece over the area to be covered (note: white fleece works better in our opinion, it is easier to see what are has been completely soaked in resin).



At this point, start stapling. You'll want to staple on the side of the ring, if you staple to the top, you will have much more sanding to do, as well as have to remove the staples for a nice clean look. We generally start stapling the fleece to the ring first, and then stretch the fleece to everything else. It makes it easier to get it stapled to the ring. On this enclosure, we decided to go with a raised look, so we stapled the fleece at about half way down on the side of the ring.



If you staple the fleece right up to the edge of the box (shown below), you can trim off the excess and will have less sanding time in the near future.



Get Fiberglassing:

You are now ready to start fiberglassing. Put that shiny new organic respirator on. Get your mixing cup out and measure out the correct amount of resin and hardener. There are two methods to do this depending on where you get your resin. The first, and most used by DIY'ers is to count drops of hardener. Follow the directions on the can - so many drops per ounce of resin, and so on. The second is mixing by weight. Using a scale, you will measure out the resin you need and add (usually) 1-3% hardener. Again, follow the directions on the can. You'll want to mix the stuff for a good two-three minutes to get it completely mixed. ***Important:** Try to get as close as possible to the desired concentrate of hardener in the resin. Do not just guess. If you get too much hardener in there (mix it too 'hot'), your resin will dry too quickly, it could warp your part from the heat, or your part could even catch fire! If you mix too little hardener in the resin, you could let the part sit for a week and it will still feel tacky.



- Instead of cleaning out your mixing cup every time, line it with plastic wrap or some kind of plastic material that will not break and is not very expensive so you can just take it out and throw it away each use.

Now, before the resin dries (you have anywhere from 5-10 minutes of working time before the resin starts to harden), you need to soak the fleece with resin. You can use a paint brush, plastic squeegee, even your fingers if you dare. DO NOT be afraid to do this in two stages. If you feel you need to mix much more resin to coat the fleece than you will be able to use before it dries, do it in multiple steps. You also may have to do a coat on the outside, then flip the thing over and do a coat on the inside.



The fleece will dry in an hour or two. (Note: You do not have to remove the dowel rods at this point. You do run the risk of warping the part due to heat from the resin curing if you do. If you take your time and lay one layer on at a time, this will most likely not happen. The choice is yours) Once it dries completely, you can carefully pry the dowel rods from the ring. Take care in removing them because the fleece may be hard but it is still brittle without any reinforcement - remember it only has resin on it, not fiberglass. You will then want to lay fiberglass on the inside of the panel. Always tear the mat into strips about the size you need. Mix the resin as you have done before and apply a thin coat to the back of the fleece. Once you have applied resin, lay the strips of fiberglass mat on fleece, and apply more resin to the top of the strips. Make sure to "wet out", or 'coat completely', the strips of fiberglass mat, but do not over-apply the resin.

You can do two layers of fiberglass mat at a time if the part is not too large. On a larger project, try to only do one layer at a time. If you use two or more, the heat from the additional resin hardening could warp your part, causing you to start over. Wait until the resin is at least mostly dry (1-3 hours) to apply a new layer of mat and resin.



HOW THICK DOES IT NEED TO BE?

Ah, that is the question everyone asks themselves from time to time. Our answer? Thick enough to have adequate strength to jump on. Rough estimates? Remember that fiberglass is stronger when curved than when straight. Try to use MDF on straight planes when possible. On a small part like this box - try three layers of mat, and test it. On a larger part? Try five layers and test it. How do you test it? When the resin is dry, try pushing on the part to see if it flexes. Use your thumb and push hard against the largest area of fiberglass - does it flex? No? Ok, put it on the ground and stand on it. If there is no flexing, it should be OK. In general terms, if you would not feel comfortable jumping on your part - you should not feel comfortable putting a sub in it. If nothing else, a good rule of thumb is about 1/4" - 3/8" thick on a normal size enclosure.

Now, to be honest, most subs will not blow your box apart if it is not adequately reinforced. But it will have that "fiberglass" sound to it if it is not built properly. A main key to proper sound is to have adequate strength!

Sanding:

Take a moment to look at your box. Visualize what the finished product will be - how you want it to look, and what all of your friends will say. Now remember that when you are sanding for hours on end. DO NOT rush the sanding process. It may take a while, if you feel like rushing - take a break. Relax, watch some TV, then continue sanding. You will be much happier with the finished product if you do not rush through it.

The first sanding: Basically you just want to get the high spots down on the fleece. Remember all of that resin that you applied to the fleece to get the basic shape? Now sand it flat. Use 80 grit sandpaper with your orbital sander, this will make it go quickly and smoothly. Do not stay in one spot for too long, keep moving the sander, you do not want a flat spot in your enclosure. Keep in mind this does not have to be perfect, this is only the first step in the sanding process. Do not fret the pinholes.



Ok, it's flat. That wasn't so bad. Now lets add some body filler. This is just like the resin, only thicker. You'll need to measure out how much body filler you'll need, and mix it with hardener as per manufacturer's instructions. You'll know when it is completely mixed, depending on what brand you buy, it will turn a different color when you add the hardener.



- Don't feel like buying a mixing board? Use a scrap piece of MDF! Works great to mix your body filler on, and if it gets dirty and cluttered, throw it away!

When you have completely mixed the body filler, spread it on with your plastic squeegee. Try to get nice and smooth so it saves on sanding later, if you can't get it perfect, do not worry - it always sands.



Body filler takes anywhere from 15 minutes to an hour to dry enough to sand it. You're wearing your respirator, right? You'll know if you start to sand it too early because you will clog up your sandpaper within seconds. Sand the body filler with the 120 grit for the first time, and 150 after the second application of body filler. After this, you should be able to wipe off the dust with a paper towel to see if there are any pinholes in the filler. If these do not come out while sanding, do not lay the sander on trying to get rid of them - this will create flat spots in your piece. Instead use a technique known as "cake batter". Before mixing in the hardener, mix up a batch of body filler with Rubbing Alcohol. Mix in a little at a time, until you get a consistency similar to, you guessed it, cake batter - then add your hardener and apply. This mixture will be able to seep into those little pinholes where the thicker version of the body filler could not. If it gets to the point where you just can not fill in those holes, try applying the cake batter mixture with a razor blade to only those pinhole areas. This may help.



As soon as you are sure you got all of the holes out. Sand the piece with 220, than 320 - you might want to block sand (yes by hand) the area because a sander may be too harsh.

Now, if you are not going to paint it - you're done! Heck, you may have taken it a bit far if you are going to cover it with vinyl, but you have a fine looking part as of right now.

However, if you are going to paint. It is now ready for the first coat of primer. Think it's smooth? Shoot some primer on it. Still smooth? If it is congrats, but if not, sand again with 320, shoot more primer, sand, etc. Do this until you are confident that this is ready for a glossy jet black finish. Good? Now sand with 400-600 grit and spray the paint.



Paint:

Now this is not a painting tutorial, but we would like to get some basic painting questions out of the way.

First, YES - you can rattle can an enclosure and have it look nice. Well then what is wrong with rattle cans? Why do people not like them? From a technical aspect, a normal HVLP paint gun is able to spray out about a 3x thicker layer onto the part than a rattle can. You can not always tell on the base coat, but the clear coat will not be as deep, and the final product will not be as glossy unless you use a few extra coats.

So why not use a rattle can? You are limited on your paint selection. Paint jobs these days are primarily 'base coat - clear coat'. Urethane paint. Rattle cans generally have the older Enamel paint. Also, a spray gun will have a better spray pattern - better atomization of the paint than a rattle can. What does that mean? It means a better finish.

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