Part Four

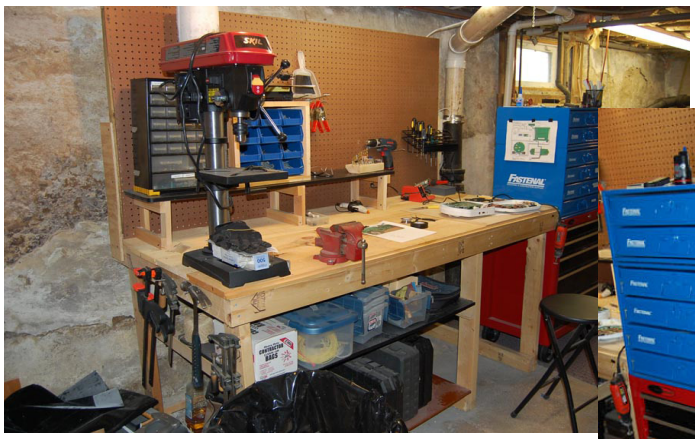
Building Your Set-Up To You Level

Now this is where you have to decide how far you want/can go with this. There are three different levels that I've made up that you can choose from depending on what your goals for being a case maker/modder are. It's always a good thing to remember though what your limits are and any obsiticals that could get in your way from moving up.

Level 1: This project is meant to be a one-time deal. It might not necessarily call for a permanent work bench or even a temporary vacuum former. You saw a portable on the Internet and you want to make one yourself. Most likely your case work will be something premade and you intend to Frankencase it for all it's worth!

Level 2: You're a DIY connoisseur and want to dedicate 90% of your free time to the art. You want to build both a permanent workstation in your garage or basement, custom fit to your applications and be able to turn out consistent quality cases which you can sell to other modders who can't produce them on their own. This requires both a custom work shop equipped with wood cutting tools and a dedicated vacuum forming table with some form of nearby heat source capable of repeated use and quality.

Level 3: You're an out-of-house professional. You have engineered equipment and CNC tooling. This is a business for you, not really a hobby. You need money to continue the operations. We won't be spending too much time with the level 3 here for obvious reasons. They have tech schools for that kind of thing!



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Work Bench

This can be anything with a flat, elevated surface. It does not have to be a dedicated area for L1 modders, but someplace that you can make a mess without catching hell for it from a mother, wife or roommate!

Ideally you will have a space that is located near a few different power sources or power strip. It will be well lit with lighting from directly over head and will have enough surface area to house a bunch of tools that will undoubtedly get strewn all over the place in the process.

Basements or garages are prime locations, and some place that can be heated or cooled depending on the weather conditions in your area. If those are not available, unused bedrooms, used bedrooms or sometimes even the kitchen table can be used as a substitute!

This is an example of my shop that I work out of. It's nothing grand, but it is a decent place to get work done. This is a bit dated, I have the pegboard filled now but it's still what works for me!

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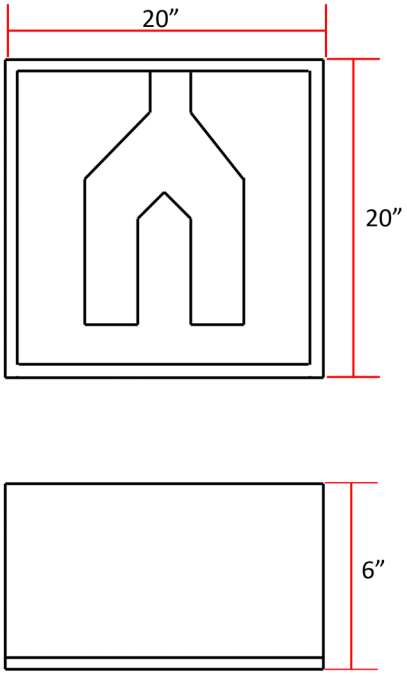
Vacuum Former & Heat Source

L1 and L2 can get away with using a conventional electric oven as the heat source for their plastic, but it's recommended that anyone L2 and above should build their own dedicated heat source.
As pictured, it's really not as difficult as it sounds.
The heat-box in this case is constructed out of ¾" Pine with a ½" Plywood base.
The inside is lined with 1/16th inch aluminum sheet metal and the heat element is taken from an old electric oven found in a scrap yard.
The sheet metal helps to both protect the wood from getting too hot and also reflects the heat within the box to help intensify the temperature.



(Figure 4-2)

If you do in fact decide to build a heat box, a garage or basement really are the only places to set something like that up for obvious reasons. Or if the conditions allow, a temporary outside set up in a driveway would work also, but is not ideal.

Now the figure above shows just one method of heat box which is easy to construct and basic to use. Plug and play pretty much. More complicated methods are out there that involve on/off switches and so on, but in the effort to keep things simple, this is the most effective basic heat box design.

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Vacuum & Vacuum Table

I've seen the use of home vacuum cleaners as a primary means of suction for the system. Though this works and you can get away with it, it can sometimes be a bit unreliable. Any Wet/Dry vacuum is going to be strong enough though because water is far heavier than anything a household vacuum cleaner could or would even need to pick up. But for L1 modders, work with what you have.

There are several ways that you can make a vacuum box, some that obviously work better than others. There is the strait vacuum box like my personal set up, and there are others that involve PVC fittings and more elaborate configurations. For the purposes of this guide, we'll be using the straight box method as it is the simplest to build and requires less material.

The making of the Vacuum Box (Vacbox) is very similar to the making of the heat box, however a few extra steps are required. The first and foremost attribute you have to keep in mind is that this is designed to be vacuum chamber of sorts and must not have any leaks where the air could escape and thus break the vacuum. This means you will have some edge sealing to do before you're ready to form.

This can be done in a variety of ways. First off, after you've constructed the bottom and 4 edges of the box, it's essential you seal all the seams, inside and out. Duct tape can achieve this well, but is not the first choice. Caulking all the seams will ensure no air can escape. Even more is to cover the caulked seams with a tape of some sort to overkill the process. Foil tape is actually a very good choice, preferred over duct tape, but if that's all you can get your hands on, it will work just fine, but takes a bit more material to get it air tight. You can repeat the process on the outside of the box as well.

What's important to remember now as well is support for your peg board surface. Depending on your material, you might not have to do this, but when using peg board, a pretty flimsy material, you have to have some form of support in the center, otherwise with a big enough span, the suction power of the vacuum when plastic is being formed can bend the pegboard inward, either causing a break in the vacuum or not forming the plastic around the mould very well. Simply putting a 2" x 4" post in the center will stop that from happening. Once the pegboard is in place and screwed down tight, the same method of sealing up the edges is required. Make sure those edges are covered!

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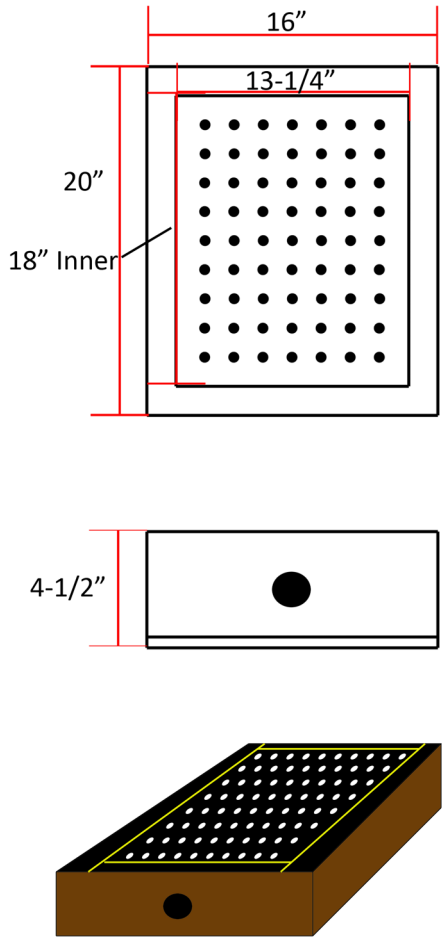
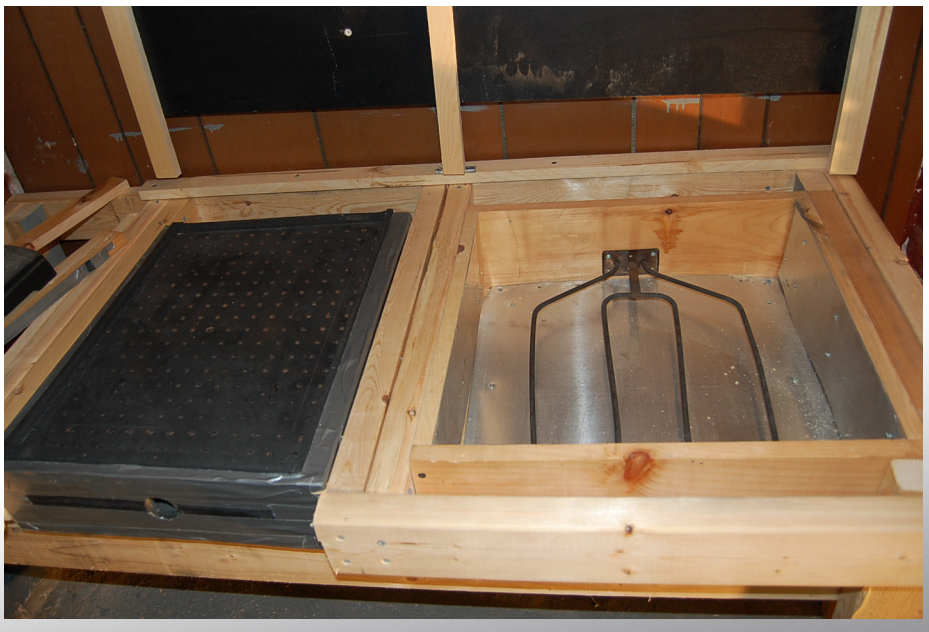
Vacuum & Vacuum Table

Now, making sure you keep that seal when there is plastic being formed is a very important challenge. I've seen the raised table method, which basically means the suction part of the table sticks about ½" to ¾" of an inch above the base of the table, which allows for the plastic to wrap the edges of the table, thus using the plastic to make the vacuum seal when it gets sucked to the deck. This is a very good method and easy to make using minimal material.

The method in my personal set-up though keeps the suction area level, but surrounded by 4 strips of weather stripping foam which makes the seal when the plastic tray is put on top. There are two reasons why I have to use this method. The first is because of my tray design. It's no secret that wood warps and twists over time and that is much amplified by the constant heating and cooling it goes though. When using ½" to ¾" thick foam as the boarder, you now have a flexible surrounding that forms to the tray. Second is it just happened to fit better with my table design and set-up. But, is this the best method out there, it might not be which is fine, but it's worked for me so far and will work for you.





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Vacuum & Vacuum Table

One very important point to remember is that you must know the max size you wish to make your casings. The size of your case determines the size requirements of your vacuum table! Though this might seem rudimentary, it's a bit more complicated than at first glance. By this I mean that a vacuum table with a suction area of say 16" x 19" will only be able to make a max part size of 12" x 15" that is 2" thick.

For every inch (1") in thickness (up to two (2") inches) 1" from each edge of the case needs to be left for slack. After 2" thick, an additional inch (1") from each edge needs to be added. You can see how this constrains the sizes of your final casing because of the plastic's exponential stretch-to-surface area factor. (See Factor Chart Below)

Example: Formula Chart for Case Size of 6"Wide x 8"Long at specified thickness.

Part Thickness	Part Width	Part Length	Table Dimensions Req
1 Inch	(1" x 1"T) x 2 Edges + W = X	(1" x 1"T) x 2 Edges + L = X	8"W x 10"L
2 Inches	(1" x 2"T) x 2 Edges + W = X	(1" x 2"T) x 2 Edges + L= X	10"W x 12" L
3 Inches	(1" x 3"T) + 1" x 2 Edges + W = X	(1" x 3"T) +1" x 2 Edges + L = X	14"W x 16" L

Note: These are suggested tolerances and minimum table size approximations

I'm sure though as you'll notice, the need to make a case 3" Thick will be very rare as you are only making one half at a time. Most portable cases rarely get above 2" thick which means that most of the time the mould plus the blocks will not get above 2" Inches a side.

Please keep in mind that these are my personal tolerances I hold myself too. It is possible to get away with less, but after several attempts at cutting corners, without leaving enough material, I've had rips, pull-outs and varied thicknesses of the plastic to the extent that the case halves did not match up! Good to be safe!

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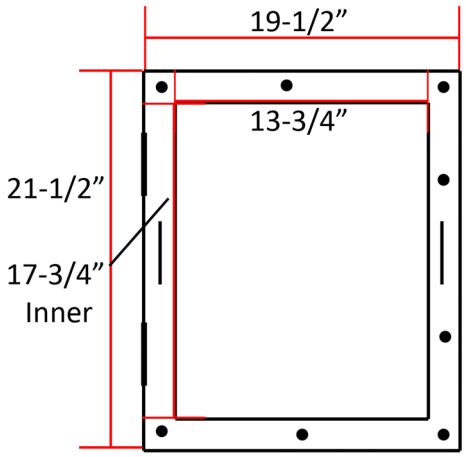
Plastic Tray Source

The tray source can be done a variety of ways but is dependent on what style of heat source you use.
My personal set-up uses two hinged pieces of 5/8” plywood, held tight by threaded inserts and screws.
Handles on the top for easy moving from the heat source to the vacuum table.
I would not recommend this method for use in a conventional oven as baking plywood at 300 degrees F can sometimes cause an issue. (This would be rare but still ill advised) In the event that you do not take my advice and torch the wood, DO NOT PULL THE TRAY OUT AND THROW IT ON THE FLOOR! The safest place for a fire is in your oven, in which case you calmly take a fire extinguisher, type B or C for electrical or grease (NOT type A as it’s just water and spraying that into an electric oven is not wise!), and extinguish the flame.



(Figure 4-3)

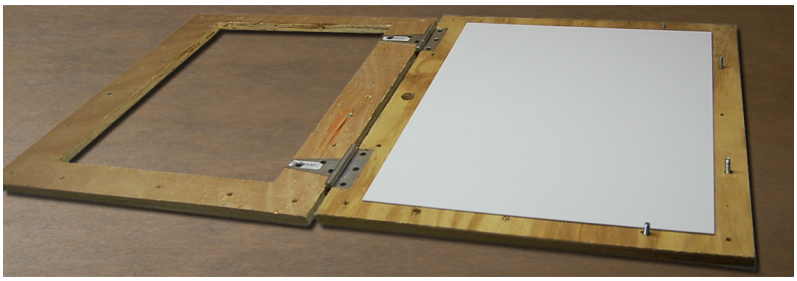


Figure 4-3 shows the dimensions of my particular tray. Two pieces of 5/8” plywood with the centers cut out to the size of the vac-table. Remember that the side of the tray that sits down on the vac-table has to be flush and remain even with the surface otherwise it won’t seal. So to prevent this, either using screws with countersunk heads or countersinking the holes in general are the best ways to make this work.
I’ve seen people who use big T-clips to hold their tray together and this does work well, however you have to be sure your vacuum table is designed properly for that application, otherwise the clips will get in the way of the seal and cause all kinds of problems.