

The “Pico” LCD Projector Enclosure

Design Notes and Instructions

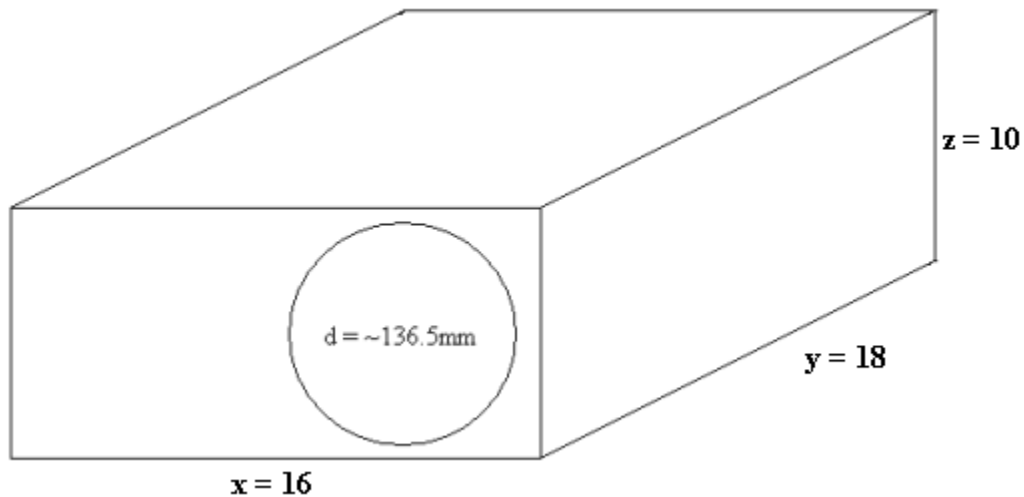
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At a Glance

The pico projector is a small LCD projector that uses our new 135mm triplet lens (380mm focal length). Below is an image of the projector shell without the lens. You should not use these dimensions exactly to cut your enclosure panels - the specific dimensions for each MDF panel are presented in the following pages of the instructions.



General Layout

Below is a rough sketch of how the inside of the Pico is designed. Note that it uses a cold mirror to reduce the amount of IR rays that strike the LCD. Without the cold mirror, you would most likely experience a heat spot (dark discoloration) in the middle of your LCD after approximately 1/2-1 hour of use. Because a cold mirror reflects light, but not IR, there is no concern for LCD damage by heat when using a cold mirror.

Another thing worthy of mention is that the Pico uses the triplet-135 model of projection lens by default. This is the best option to achieve a reasonable-sized, high-intensity projection image from longer throw distances.

Cutting Instructions

In order to cut the panels for the projector shell, it is recommended that you use 1/2" MDF wood, available at Home Depot and other major home improvement stores. You can also substitute plywood or particle board, though MDF is typically smoother (nicer looking). Below are the dimensions and quantities needed for each panel of the pico projector enclosure. Note that the side panels can be made from much thinner wood if desired. For the purpose of creating a more light-weight enclosure, all of our Pico projectors ship with 1/8" thickness plywood for the side panels.

Panels Needed

(2x) Sides: 18" x 16" x 1/2" or 18" x 16" x 1/8"

(2x) Top/Bottom: 17" x 9" x 1/2"

(1x) LCD Holder: 17" x 8-1/2" x 1/2"

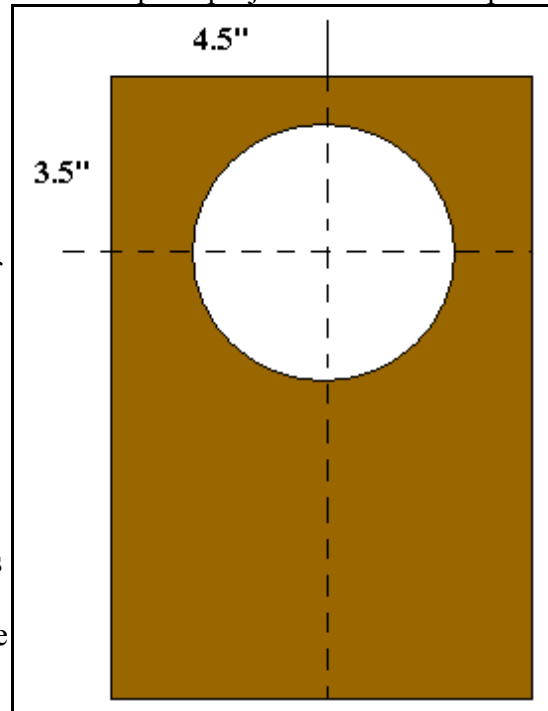
(2x) Front/Back: 16" x 9" x 1/2"

Forming the Panels

Now that we have all of the MDF cut for the basic enclosure, we now need to cut the holes for the triplet lens, cooling fans, LCD, and power cord. For this step, you should use some type of reciprocating saw if you have access to one, but a keyhole saw is a very inexpensive alternative (though it will take longer to cut). Recall that all of the DPC complete projector kits include pre-cut panels with all of the necessary holes drilled, making these steps unnecessary.

Triplet Lens Hole

Using your saw (or a hole-cutting bit in a drill press), make a 136.5mm hole in the front panel as shown in the diagram to the right. If you do not have a means of making a hole with this kind of accuracy, you can alternatively trace around the bottom of the lens onto your panel, then cut just inside of this line.



Fan Holes

The pico deluxe kit ships with 2 80mm PC case-style fans. You can use larger fans if you wish, but 80mm is sufficient. In your rear MDF panel, mark and cut two fan holes - an intake and an exhaust. You can put these nearly anywhere you like, but it is recommended that you center them along the longer center line of this panel and space them out such that the holes do not come within 1/2" of either of the side panels or the middle of the rear panel (where the LCD tray will attach).

Power Cord Hole

I use a 1/2" bit to bore the hole for my power cord. You should choose a hole that is slightly larger than the diameter of the power cord you are using. Whichever half of the rear panel you make this hole on will encapsulate the ballast/lamp section of the projector. The placement of your power cord hole is not very important, but it should be sufficiently far from the fan to allow for better cooling.

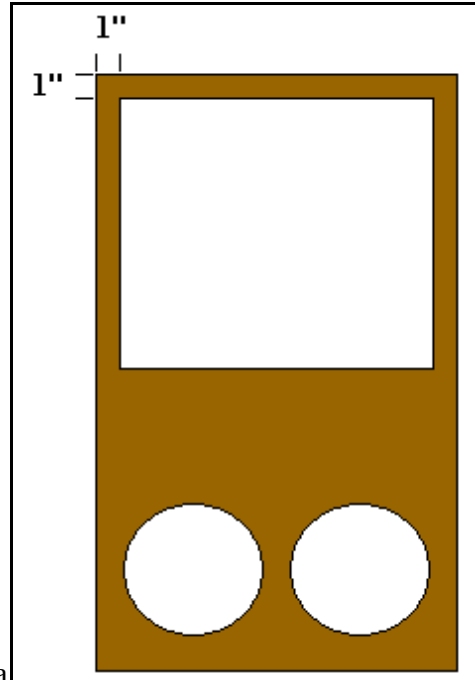
LCD Tray Opening

If you purchased your pico enclosure from DPC, then the LCD opening is already cut to approximately 7"x7". This is to allow for maximum compatibility for different sizes of LCD panel. You may choose to cut your LCD opening to the same size as your LCD image size. This prevents any more light/heat from entering the upper compartment of your projector than is necessary.

Cut the hole for your LCD panel starting 1" away from the rear edge of the LCD tray (where the rear MDF panel will attach) and make it centered along the longest centerline of the LCD tray panel. This ensures that your LCD will have maximum cooling and more even light distribution over its surface. You will also want to cut a hole or two at the other end of the LCD tray to allow for better air circulation. I recommend cutting them to be approximately 80mm in diameter in case you later want to put another fan in the projector to help move air between compartments.

Enclosure Painting

I personally like to paint the inside of all of my projectors flat black. This keeps the amount of radiant light to a minimum and helps to keep the color of light as pure as possible. With high color temperature lights that produce a lot of blue spectrum light, the mixture of blue light with the yellow sides of the projector can sometimes give the image a greenish/yellow tint. If you wish to paint your projector, it is a good idea to paint it now before you start assembly. Only one side of each panel needs to be painted (whichever will be the inside) except for the LCD tray, which should be painted on both sides. If you don't already have black paint, request "lamp black" paint from your local paint shop or just use flat black spray paint.

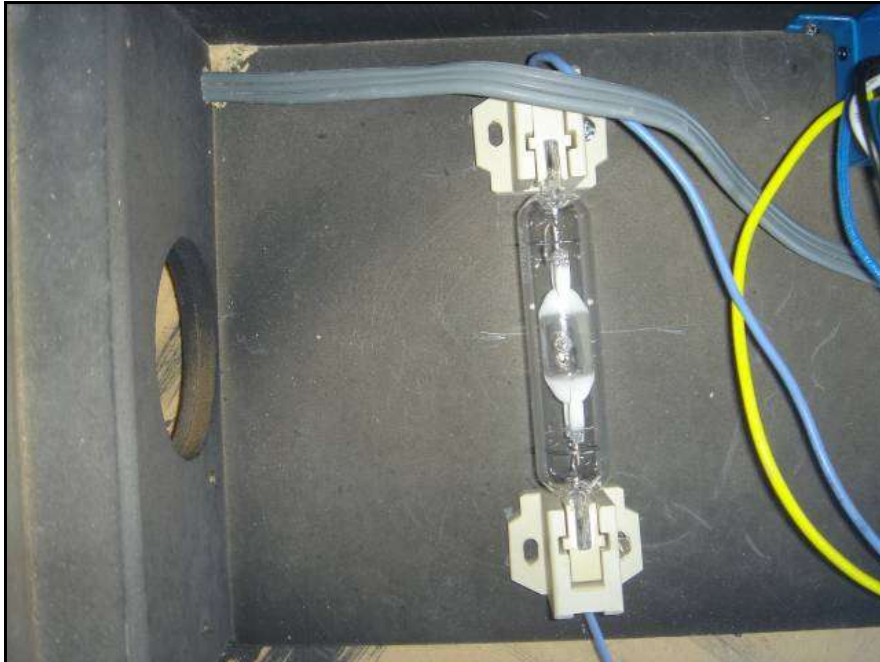


Installing the Light Source

The pico projector is small enough that it should only be used with our 250w HQI metal halide light kit. You can attempt to use more powerful light sources, but in those cases you will need to use IR-filter glass behind your fresnel lens (recommended anyway) and use enhanced cooling to avoid burning the insides of the enclosure.

To install the light source in your pico, locate your bottom panel of MDF. You will want to carefully install the lamp into the lamp holders by sliding each end of the lamp into a lamp holder. It does take some firm pressure from your thumb onto the lamp end in order to get it to click into the lamp holder.

Now use a pencil or other marker to make a dot in the location described by the image below. Then center your lamp assembly over this location and mark where the holes from the lamp holders will need to be drilled through to the MDF surface. Then use short wood screws (1/2" long) to secure the lamp holders to the bottom panel of MDF. Do not over tighten - the lamp holders are ceramic and will crack!



Installing the LCD Panel

These instructions assume that you have an LCD panel that has been modified to the point where you have a translucent LCD with no circuit cards or other elements behind the image part of the LCD. If you do not have your LCD panel modified to this extent, please view our [projection panel modification guide](#) or post your questions on the [forums](#).

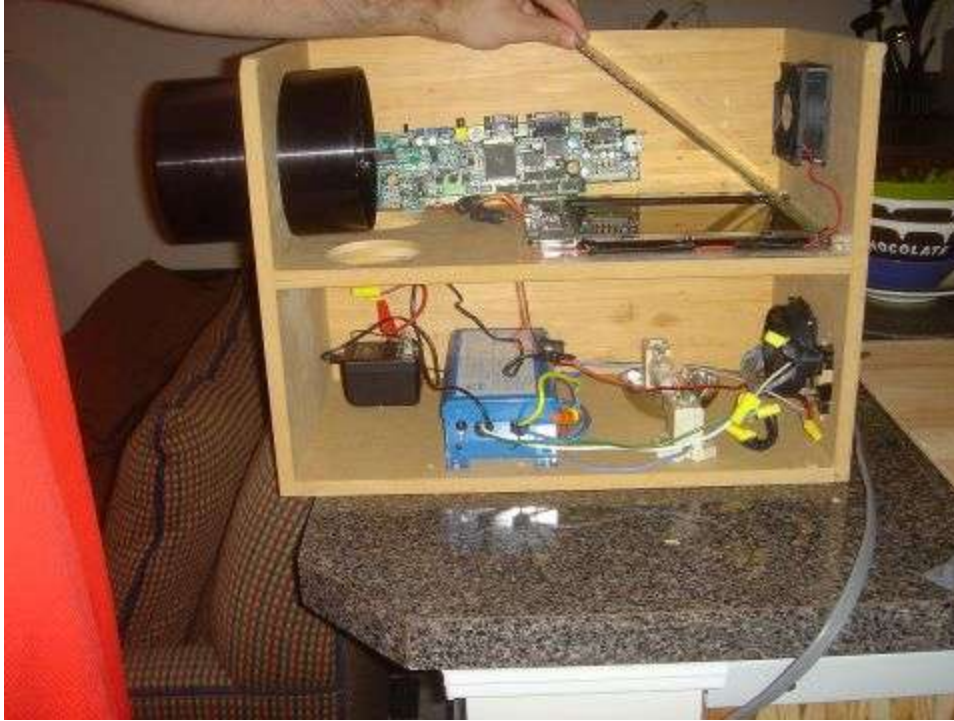
For this part of the pico assembly process, you will need the two fresnel lens halves that you wish to use in your projector. The recommended fresnel lens is that 330mm focal length fresnel lens set available in DPC's [online store](#). Install your fresnel lenses by putting them groove-to-groove (smooth sides facing out), then decide how you want to mount them to the LCD tray.

First, put your IR filter glass (included with the pico projector deluxe kit) on the LCD tray, then use RTV gasket seal maker as an adhesive to affix the two fresnel lenses to the top of the IR glass, and to affix the entire sandwich onto the top side of the LCD tray. It is important that the groove side of each lens be touching the groove side of the other lens or you will not get a good image.

Note: if your LCD tray is only 8.5" wide, then it is okay for the fresnel lenses to overlap the edge of the LCD tray by up to 0.5" only on one side since the inside width of the pico enclosure is actually 9".

Next, to mount the LCD panel, you have a couple of options. The method that I use is to again use some RTV seal on the corners of the LCD frame (metal part only) and then press the LCD against the fresnel lenses once they've been mounted correctly. This method provides a semi-rigid mount that will also absorb some vibrations in the event that you bump your projector. Another option is to use some sort of metal mounting hardware around the edges of your LCD panel. This solution will be different for nearly every LCD panel used since they all have different mounting dimensions and different frame types. In general, the only rule that applies is to use firm, but not overly-tight pressure with your mounting rig since it is relatively easy to crack your LCD panel if you over-tighten.

Mounting your circuit cards for the LCD panel is different for every model of LCD panel, so I won't go in to specifics. In most cases, the ribbon cables on your LCD panel will dictate how you must mount your LCD panel. Another thing to consider is that where the circuits are placed determines where you'll need to cut holes for your video inputs. If your circuits don't position nicely for video inputs, then you can also purchase RCA or Svideo or VGA input connectors to mount elsewhere and then run wires from that input connector to the circuit card. Below is a picture of what the pico looks like with a Sharp QA-1150 LCD panel installed. Notice that the circuit card doesn't mount in such a way that the video inputs would fit very nicely through the side of the projector. I remedied this by just cutting a hole in the back-upper part of the projector and running my Svideo cable directly to the circuit on the inside of the projector.



You will note that I am holding the mirror in this picture. To install your mirror, place your projector with the side on your work surface (laying down horizontally) with the top panel fastened. Then, with the LCD panel still installed, put your mirror into your projector at a 45 degree angle as I have done here. Use a short piece of dowel or some epoxy to secure the mirror at this angle. I recommend that you not use epoxy unless you are completely certain that your mirror angle is correct. If you use the dowel, it should be used on the top edge of the mirror, fastened into the top panel of the projector (not shown in the above image) so that it applies sufficient pressure against the mirror to hold it at this angle. You may also wish to use some rubber cement or other fastener at the bottom or sides of the mirror to avoid it moving as you move your projector in the future.

Partial Assembly, Fan Installation and Wiring

By now you should have the lamp holders installed in your projector. If you also have the lamp in the holders, remove it and set it aside for safe keeping until you are ready to use your projector. For the next step, you will need your cooling kit (fans and power supply) and your lighting ballast.

First, install the fans. This is done by using 2-4 woodscrews for each fan, and attaching them on the inside of the projector such that the moving fan blades line up with the hole cut in the rear of the enclosure. One thing to note is that nearly all cooling fans have an arrow stamped on the side of the fan that indicates the direction of the air flow. Since the lamp creates hot air, and we want to keep the LCD panel cool, the fan closest to the lamp should pull air out of the enclosure (away from the LCD) and the other fan should push in fresh air across the LCD surface. There are holes under the projection lens area on the LCD tray to allow the fresh air to circulate into the lamp portion of the enclosure so that you will have a good flow.

Once your fans are installed, wire them to your 12vdc power supply (or other power supply) using [these instructions](#).

When you have finished wiring your fans to their power supply, you can now install the ballast. If you have not already done so, use a few small (1/2 inch) woodscrews to secure the lighting ballast to the inside of the pico projector. The ballast can generally be located anywhere it will fit, but it is best to mount it in the corner opposite where the projection lens will be mounted on the same panel where the lamp holders are fastened. Install the ballast so that the lamp wires are facing the direction of the lamp since they are not long enough to use if you install the ballast facing the other direction.

When you are ready to wire your ballast, use these [wiring instructions](#). Then you are ready for the next step.

Final Assembly

By now, you should have the fans installed and wired, the ballast and lamp holders installed and wired, and the LCD panel installed and wired. Now you are ready to button up your enclosure and test it for the first time.

First, install the metal halide lamp into its lamp holders by pressing it in firmly. It does take some pressure on the ceramic ends of the lamp to get it to install correctly, but do not use excessive force or strike the lamp to install it.

Once the lamp is installed, fasten the remaining side cover to the rest of the enclosure so that the enclosure is now completely sealed. Now, carefully rest the projector on its side horizontally (if that is how you installed your LCD panel) and plug in the power cord all power connections for your LCD projector. If you wired everything to a common plug, you should obviously have only one plug.

After anywhere from 5 seconds to a minute later, the light will illuminate and start to get brighter slowly as it warms up. The amount of time it takes for the lamp to first ignite depends on several factors including the model of lamp, room temperature, and age of the lamp in terms of hours of usage.

If you get light, then install the projection lens by sliding it into the large hold in the front of the projector. As you slide it in and out, you should notice an image of your LCD panel coming in and out of focus on your wall. If the lens will not slide easily, you can lightly sand the inside of the hole where you are installing it (with the system turned off).

That's all there is to it - you now have a DPC Pico Projector that you built by yourself! Play with your projector for a while to test different positions in the room and settings on your LCD panel to get the best picture possible, then hop over to the [public forums results gallery](#) and post results of your very own LCD projector!