ArcadeCab's MAME Cabinet Plans- 2nd Set

This is a PDF copy of the online cabinet plans, found on www.ArcadeCab.com, just stripped of most all the full-screen images. This document was created to provide individuals with an easy-to-print paper copy to work from.

I hope this helps you with your goal of building your own MAME cabinet. If you have any questions, fee free to contact me at Mike@ArcadeCab.com. If you use these plans, be sure to send pictures of the completed project for me to display.

Have a great day!

Mike Trello
February 26th, 2009

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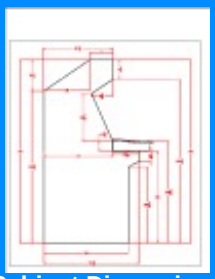

Cabinet Dimensions

Cabinet Plans 2: Background

Background

Welcome to my second set of FREE cabinet plans. Since I put the original help document on this site in 2003, a much larger number of people have benefited than I would have ever dreamed. Barely a week goes by without at least one email thanking me for the resource. I am grateful for those who take the time to email me and even happier when the visitors complete a cabinet they never knew they could build for themselves. *Please continue to send me any progress and/or completed pictures of your cabinet- I'd love to post them on my site.*

There are areas in the first set of plans that are vague or missing completely that I hope to rectify in this new set. Expect to also see detailed explanation of the control panel build, how to wire up the coin door, and how to add one-click on/off switches. Between the two set of plans you should be able to have most any question you might have answered.

The page layout differs from the first. The table of contents is on the right of each page now, with the website controls on the left, consistent with the rest of the site. The cabinet dimension PDF is also included on each page, for easy access. Photos will be interspersed within the text, and the photos can be clicked to full-screen size. I have opted to increase the size of each large image to show greater detail. There are more photos than in the first cabinet plans. The text on each page will be more verbose (read: more detail) so please bear with me if I ramble in spots. My writing skills, you will see, have not improved since the first document.

The MAME cabinet shown is for my brother-in-law. He has wanted his own arcade cabinet since the very first visit to my home and we finally have gotten together to make it happen. He is an accomplished comic book artist and the finished product will show off his skills.

I had several design goals that differed from my first cabinet:

1) No external screw holes,
2) Lighter-weight, but equally sturdy, internal framing, and
3) Constructed specifically for a custom controller.

Now that we have the background out of the way, feel free to move on through the rest of the document. The pages will be added to gradually, as work is completed on the actual cabinet. Pages will continue to be refined/ edited during this process but I felt it would be better to get some of the pages up than to wait for the finished cabinet. If you see any errors, please email me so they can be corrected. If any section seems confusing, let me know so it can be made clearer.

The next page shows the basic tools you'll need to get the job done.

Tools->>>

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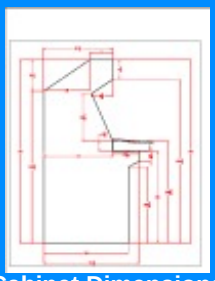

Cabinet Dimensions

Cabinet Plans 2: Tools

Tools

The tools that are shown throughout this document are: circular saw, jigsaw, table saw, drill(s), router, clamps, saw horses, tape measure, and pencil. You can get by without the table saw but it is nice to have.

I used 1" and 1-1/4" course drywall screws exclusively on this project. The holding power is excellent.

Be careful with the tools and take the time to understand how they function. If you are new to a tool, test it out on scrap wood before moving to your cabinet. Remember that you'll need all your fingers to play the games when the cabinet is complete.

Below are a few pictures of the key tools.

The circular saw. If you don't have access to a table saw, this will serve you almost as well. I have a plywood cutting blade in it, which does a very nice job with my cuts. This blade will also cut laminate.

The router. I cannot say enough good things about it- it is a critical tool for me. This beauty is over 30 years old (thanks Dad) and still works perfectly, handling everything I throw at it.

Corded drill. Even if you have a nice cordless drill, I would really recommend having even a low-end corded drill. You don't want to run a battery dry at an inopportune time, and you will occasionally need the extra torque.

The jig saw. It is handy for cutting the first side. Run it against a straight edge and the resultant cut is nearly impossible to discern (by sight) from a circular saw cut. The downside is it takes a lot longer to cut with than the other saws.

The main router bits I use are the slotter cutter (far left), the flush cutter (second), and the 3/4" straight bit (third from left). You can tell the bits have seen some use. The next bit is the combo-drill bit/countersink which saves me time. 3/8" spade bit is second from the right, and, lastly, the 1-1/8" spade bit (for the control panel). The parts you need for the slotter are 6700A and A200B from this **page**, and part #2400 from this **page**.

Saw horses. I have four on-hand and use them constantly. I have found the cheapo ones work just as good as the higher priced ones for the application we need them for. I just would not recommend expecting them to hold your body weight in addition to the board weight for any length of time. In other words, no napping on construction days.

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I love these small, quick-release clamps. I own two and they are used all the time. You should invest in at least a set. They are expensive but worth every penny.

These are the two clamps I use to hold the cabinet sides together during test fittings. They are 24" long.

This is a combination drill bit and countersink. It is a huge timesaver.

The cabinet is held together primarily with 1" and 1-1/4" course drywall screws. They are quite strong (never had a head break off like with other screws), have a nice flat head, and have a fantastic grip. A pound of each will be plenty.

Just for informational purposes, I've included this shot of some common router bits. This is a set I purchased from a traveling tool sales tent that visits our city annually for about $10. The 3/4" (and 1/2") straight bit(s) I use are from this set and have more than paid for entire set.

I might mention additional tools later in the text but these are the key tools that will get you far in the project. If you don't want to purchase them, see if you can find a friend (or co-worker) to borrow from. I've had emails of persons who have done just that, and the co-worker has ended up becoming interested in MAME as a result. Great stuff!

<<<- Background Materials->>>

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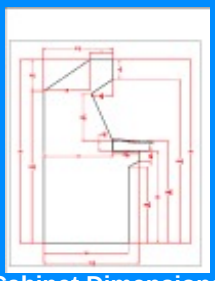

Cabinet Dimensions

Cabinet Plans 2: Materials

Materials

I prefer 3/4" birch cabinet grade plywood for anything that is to be painted or stained. The quality is a pleasure to work with. MDF would be a cheaper option but there are several downsides when used for a cabinet: it is significantly heavier, screws can split the wood, it is more suseptical to moisture damage, and the dust from cutting it is extremely fine and a breathing hazard. I do use MDF in all my smaller controllers but the extra expense for the plywood was justified.

The ledger boards were of two different sizes, 1x2 and 3/4"x3/4". I purchased what Lowes calls 1"x4"x4'boards (actually 3/4"x3-3/4") and ripped them to 3/4" wide on the tablesaw. You'll want the straightest boards with minimal knots that you can find. These ledger strips are used in some situations, and the 1x2 boards are used in other. I'll explain these boards in detail on the Ledger Board page.

Below if a list of materials I used. The tools have been left off. I also left off the prices as they vary so much from location to location, and some items you might be able to find bargains on. I have also left off the control panel parts. These will be discussed in that section.

Item	Qty	Where From
4x8' sheet of 3/4" birch, cabinet-grade plywood	3	Lowes
Ledger Boards		
Coin Door (Happ over-under)	1	ebay
T-molding (3/4" blue, smooth) - 40' (T-molding.com carries colors other than black)	1	Happ
Marquee Retainer - 10'	1	Happ
Keyboard drawer slides- 16"	1	Lowes
1-1/8" Utility Cam Lock	1	Lowes
Drywall screws- 1" course thread	1 box	Lowes
Drywall screws- 1-1/4" course thread	1 box	Lowes
Drywall screws- 1-5/8" course thread		Lowes
Cabinet Screws - 3"	8	Lowes
3" paint rollers (3/8" smooth pile) (2 pk)	6	Lowes
Kilz (gallon) tinted	1	Lowes
Valspar Duramax Latex Gloss Enamel paint (gallon)	1	Lowes
12" fluorescent light w/ 6' cord	1	Lowes
2" Industrial Casters - Rotating and locking	2	Lowes
2" Industrial Casters - Rigid	2	Lowes
!!!!!!!! hinges	1	Lowes
Foam brushes (1" and 3")	6	Lowes
Tack cloth	6	Lowes
L brackets (4 pack- 1-1/2" x 5/8")	2	Lowes
1/16" slot cutting bit w/ arbor	1	RouterBits.com
Valspar Multi-purpose Black Enamel Spray Paint	1	Lowes
1/4" glass - xxxxxxx	1	Vision Glass

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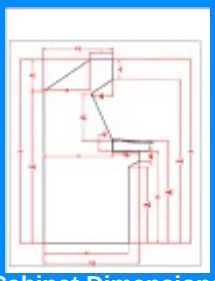
<<<- Tools Cutting Side One->>>



Cabinet Dimensions

Cabinet Plans 2: Cutting Side One

A note before we start

The observant reader will notice that the photos on this page show MDF not plywood being cut. I created an MDF template to make sure the design would work out before cutting the ply. Everything did so I used these pictures.

Starting Out

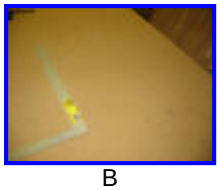
To begin with, lay your 4x8 sheet out on two saw horses. Taking the measurements, draw out the cabinet on the sheet. Take your time; everything *can* be drawn using the supplied measurements.

The order I made my cuts is shown in the diagram to the right (click for a larger view). This isn't necessarily the optimum order, it is just what worked out best for me. You can refer to the cut numbers as you read through the description.

The first cut (#1) was made with the circular saw. I cut the excess material from the top of the board. I lined the cut up with the very top of the cabinet (72" from the base). See picture C.

The second cut was the angled back of the cabinet. Picture D shows the setup for the cut.

A


B

C

D

The marquee area was the next circular saw cut (cut #3). I just cut straight down, going past the marquee area. E shows the setup and check out picture H for how far down I cut. This just gave me less excess material do have to deal with later on. The fourth cut was to cut up from the bottom, toward the controller ledge. I used the circular saw and cut up as close to the controller support as I safely could. Cut #6 was the straight bit on the front of the controller area, again with the circular saw (see photo H). The rest of that area will be cut using the jigsaw.

E

F

G

H

Photo I shows the progress so far. The jigsaw is used, with a board as a straight edge, to make the 6th cut (see J). It is again used for the top portion of the controller support (#7 and photo K). The speaker and monitor areas are also completed with the jigsaw (see L for the completed cuts).

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I

J

K

L

The final cut, #10, is done with the jigsaw. The slight curve was made with a sanding bit on the drill. A bit of sandpaper wound around a piece of 1" dowel and a little elbow grease could also do. Now you should have something resembling picture O.

M

N

O

<<<- Materials **Cutting Side Two->>>**

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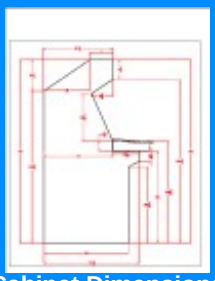

Cabinet Dimensions

Cabinet Plans 2: Cutting Side Two

The Second Side

The second side is a lot easier than the first. First, place the full plywood sheet down on the sawhorses, good side down. Now place the completed side down on it. Square up the back and bottom edges perfectly. Trace carefully around it. Take the first (completed) side off and it set it out of the way. You will then cut around the outside of the line. My method is to simply cut around the lines with a jigsaw, staying within 1/2" of the line, as in picture A. You might need to take a break halfway around to give the blade a few minutes to cool down. Be sure **not** to touch the hot blade (Scott!).

Note: Make sure the two best sides will end up as the outside of the cab. Even on this quality of plywood, there is a better (smoother) side.

Next, pick up this rough-cut second side from the sawhorses. Take the completed, first side, and lay it back down on the sawhorses. Lay the second side atop this first side, carefully lining up the back and bottom edges. Clamp the two sides together with at least four clamps. You do not want the boards to shift at all.

Take the router and insert the **flush-trim bit** into it. *(Note- In case you missed it on the **tools** page, the slotter is made up of 6700A and A200B from this **page**, and part #2400 from this **page**.)* Adjust the height of the bit so that the ball-bearing is riding on the bottom (completed) side. The cutting portion should only be touching the unfinished board. Lock everything down and begin to route the second (top) side. Move from left to right. Pictures B, C and D shows. Take your time. Go back for a second pass to clean up any rough spots. Wa-la, the two sides are now identical.

Remove the top side and stand it up out of the way. Take a break and admire your handiwork (as in E). But it's not quite time to celebrate with a beer yet. You still need to slot the two sides (for the T-molding).

A

B

C

D

After the router cools for at least five minutes, swap out the **flush-trim bit** for the **slotter**. You will need to center the cutter in the middle of the plywood edge. The plywood that I had was seven-ply, so this task was simple. I adjusted the router height until the cutter was perfectly aligned with the fourth (middle) layer. I then tested it on a **scrap(!)** piece of plywood, snapping a small piece of T-molding into the groove to make sure it was perfect. Once I decided it was, everything was tightened down again on the router and the first side was slotted. As always, move from left to right when using the router (just like reading a book). I slotted everything except for the bottom. *Be careful to keep the router flat against the plywood surface at all times.*

Take this finished side and put it against the wall. Place the other side piece down on the saw horses and route it. In just a couple minutes, you'll have two slotted sides. Congrats!

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<<<- Cutting Side One Dado for the Base->>>

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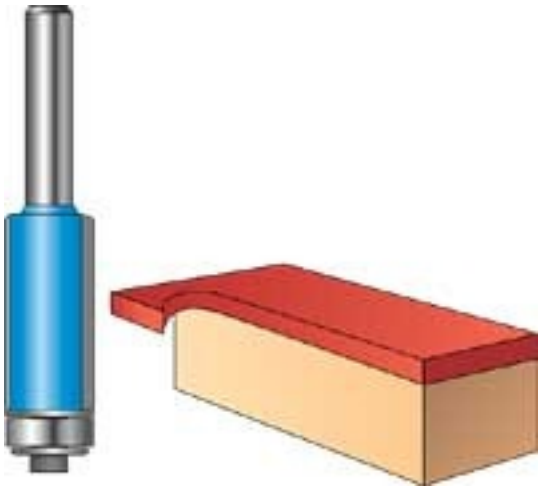
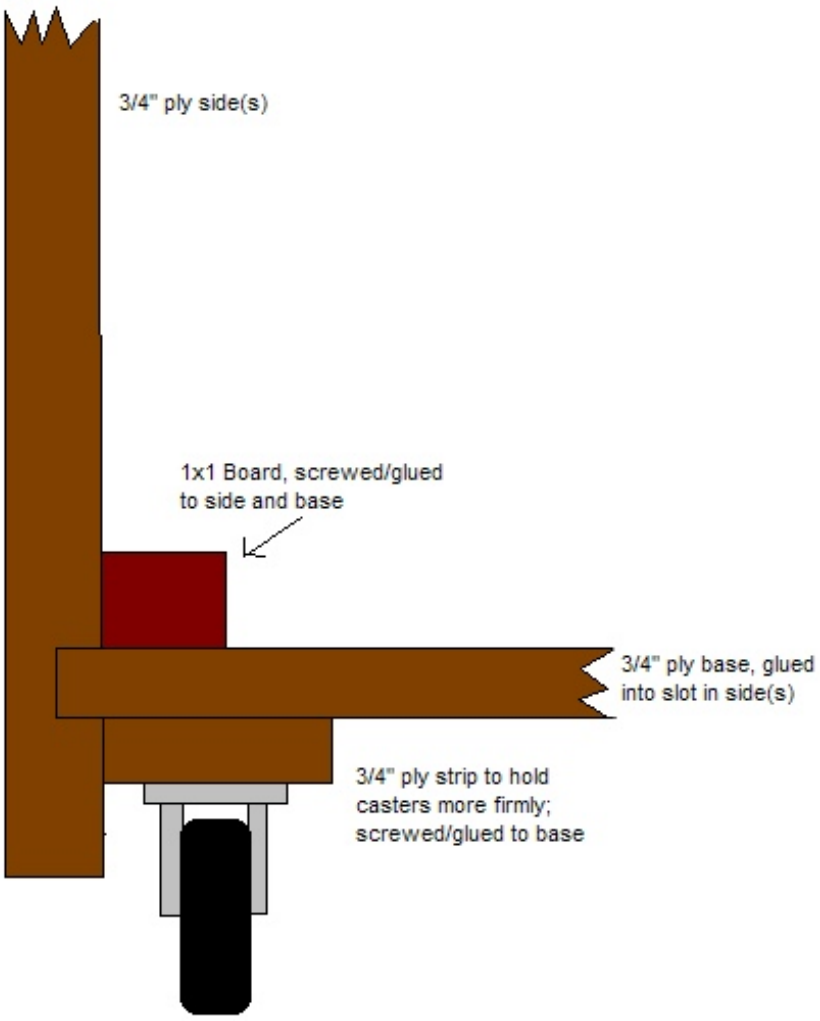


Cabinet Plans 2: Dado for the Base

Dado for the Base

I used a different construction technique for the base this time around than on previous builds. The key reason is that I did not want any screw holes on the exterior of the cabinet. The solution to this was to create slots on either side for the base to sit inside. I used that technique in the past for my entertainment center. The slot is cut 3/8" deep, which is half the plywood thickness. Trust me- this is very sturdy. Below is the diagram of how it will work.



Before I begin detailing how I created this slot, let me explain the calculations in general. The base will be inset 1-1/4" from the front (1/2" inset + 3/4" for the door), and 1/2" from the back. The lower half of the back is open so we have just the inset. If you want to enclose the back of the cabinet, just add the 3/4" for the backing board to the 1/2". The base needs to be raised some to allow for both the casters and the 3/4" ply strips that the casters will screw into. (The base construction is detailed on the next page.) I measured the casters at 2-5/8". From my current cabinet, I know that 3/4" of caster sticking out below the cabinet is about perfect for carpet. The cabinet sides appear to be floating just above the carpet, which is a nice look. You might drop this to 1/2" if you plan to have it on a hardwood floor, but all my calcs assume a 3/4" exposure.

Knowing all these numbers, you can figure out where the top

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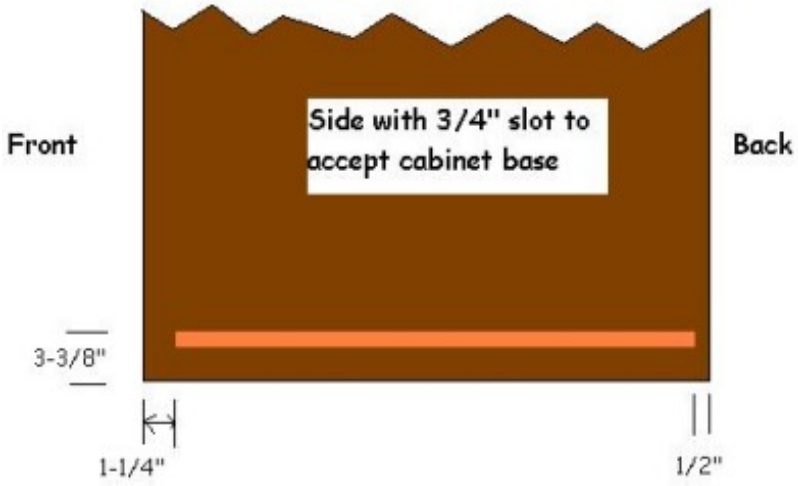
of the slot should be. The simple math is below:

3/4"	Base plywood sheet
+3/4"	Ply strips the casters screw into
+2-5/8"	Height of the casters
-3/4"	Amount the casters will stick out from the underside of the cabinet
---------	
3-3/8"	How many inches from the bottom of the cabinet the top of the slot will be (see picture A)

Now let's begin showing this process step by step. First lay out the first cabinet side so the front of the cabinet is to your left. Next, measure and mark 1-1/4" from the front. That will be where your slot will stop at. Next measure up 3-3/8" from the bottom and draw a line across the side. That is the top of the slot. Measure, and mark, 1/2" in from the back of the cabinet. That will be the other stopping point.



Location of the slot for the cabinet base to connect with

Load the 3/4" straight bit into the router (B). Measure the distance from the edge of the bit to the edge of the router. This number will be needed to offset your straightedge. Mine is 2-1/2". I add 2-1/2" to the 3-3/8" and arrive at 5-7/8". This is where I will place the straight edge for the router to travel along (see picture C). Clamp the straight edge down.

Next you will want to adjust the cutting depth of the router. Set it at 3/8". I always eyeball it by placing it on the edge of a ply sheet and seeing where the bit will actually cut to. Picture D shows this. When you get it adjusted perfectly, tighten the router down and plug it in. Time to cut the slot.

A

B

C

D

I started about an inch in from the left edge. I started the router up and slowly (keeping the router against the straightedge) brought it down into the wood. It'll take a second for the bit to chew through the wood. Once the router base is flat against the plywood side, slowly cut to the right. You might need to stop a couple times to clear all the dust from the slot- you are cutting a fair amount of wood here. Stop when the router bit reaches the

right end line that you marked 1/2" from the backside. Then go back and cut to the far left line. What this will leave you with is a rounded bit on each side (see picture E). You'll want to square off the two ends to make the base fit in the slot nicely.

To make the ends nice and sharp, I use a 3/4" wood chisel but you could clean it up with simply a hammer and screwdriver. You just want the two ends squared off and not rounded as they are right now. This will only take a minute but when finished you'll end up with something like picture F shows.

Take this side off the saw horses, set careful to the side, and follow the same steps for the other side. *Be careful to note which is the front and which is the back side when placing your stop lines.*

E

F

Next we will build the base itself.

<<<- Cutting Side Two **Building the Base->>>**

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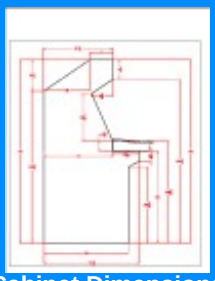
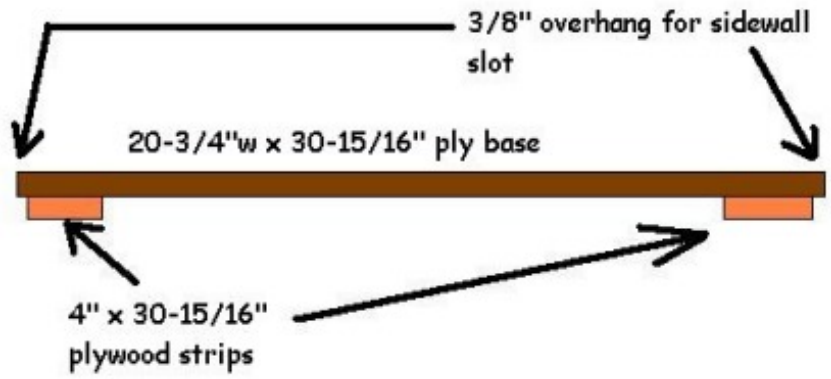


Cabinet Dimensions

Cabinet Plans 2: Building the Base

Building the Base

Cut a piece of plywood that is 30-15/16" x 20-3/4". You will also need two plywood strips that are 30-15/16" x 4". Take one strip and place it on the plywood base, aligning it 3/8" from the edge (see B). Pop a couple 1-1/4" screws (I actually countersunk in 1" screws instead) to hold it in place. Repeat with the other side. See pictures C and D. Flip it over and test fit it into the side slot. It should fit nicely (as in E). Now set this base safely out of the way. You have more work to do before you need this piece again.



End view of the cabinet base

A

B

C

D

E

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<<<- Rabitting for the Base Monitor Shelf->>>

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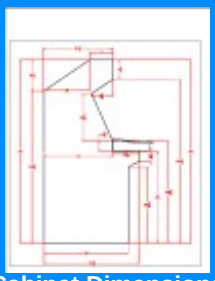

Cabinet Dimensions

Cabinet Plans 2: Monitor Shelf

The Monitor Shelf

We used a flat panel (LCD) monitor for this project so the measurements shown are specific to it. The process is the same, though, for any monitor you choose to use. The exact measurements might differ.

Start by cutting a plywood board 20" x 14-1/2" (see A), and two 1x2 ledger strips 14" long.

Measuring for placement

The easiest and most accurate method for locating the monitor shelf requires your actual monitor. You'll need a second set of hands for this step, preferably a pair you trust holding your expensive monitor. First, measure the monitor screen from top-to-bottom. Now subtract that number from 20-1/2", and divide by 2. This number is how much space will be at the top and bottom of the monitor screen within the monitor area of the cabinet. See the picture to the right to see where the 20-1/2" came from.

What we did was to hold the monitor in the correct location, with the monitor face at the same angle as the front of the cabinet. Using the number from the previous calculation, adjust the monitor so that it is this number of inches from both the top and bottom point (see picture above for the two points). See pictures B and C to see what I am talking about. I then placed the monitor shelf flush against the underside of the monitor's base, and drew a pencil line along its underside (see B and E for the pencil lines). This will be the **top** of the ledger board. By using the actual monitor in this process, you are guaranteed to have it be exactly correct when finished. Picture F shows how nicely the monitor is situated. *Also notice how patient Scott is with my picture-taking.*

A

B

C

D

Take one of the two ledger boards. Aligning it with both the front of the cabinet and the pencil line, screw it in place. As with all my holes, I used my combination pilot/countersink bit to recess the screws. I used 1-1/4" screws for this (see G).

E

F

G

In order to transfer the measurements to the other side, I simply measured from the bottom of the side to the pencil line at both the front and the back of the cabinet, and wrote these two measurements down. Swapping the two sides, I measured, drew my line, and attached the second ledger. Very quick and easy.

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Next up is the attachment of all the ledger boards.

<<<-Building the Base Ledger Boards->>>

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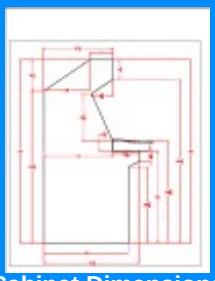

Cabinet Dimensions

Cabinet Plans 2: Ledgers

The Ledgers

We have already installed the ledger supports for the monitor shelf. Now we add the remaining ledgers that will hold the cabinet together. The ledger design is such that all the screws will be installed from the inside of the cabinet, with no external screw holes to patch. It also makes disassembly of the cabinet easy. This was important for us and will allow Scott to paint the cabinet pieces while they are laid out flat, which is **far** easier than when the cabinet is completely assembled.

To make your life easier, lay one cabinet side down on two saw horses. You might want to refer to the picture to the right for all the ledger measurements I refer to.

The ledger for the base

Using the 1x2 board, cut two 31" strips. Before attaching to the side, countersink/pre-drill four holes in the top side to receive the screws that will hold the base in place. Then align the bottom of board with the top of the dado (slot) and attach it to the cabinet side.

The ledger for the top

Using the 1x2 stock, cut two 5" strips. Locate the top of the strip 1-1/4" down from the top of the cabinet side. This allows a 1/2" inset once in factor in the 3/4" top board. Countersink and attach this board.

The remaining ledgers

For the rest of the ledgers, I took a piece of 1x4" stock 4' long and cut two strips 1" wide using the table saw. This allows us to use 1-1/4" screws that, when countersunk a bit, will hold the cabinet panels very securely without fear of popping a screw head through the exterior side.

For each of the remaining ledgers, I predrilled and countersunk the holes on the two sides (top and one side) before attaching to the cabinet. See pictures B and C for a visual description. Then I located each ledger 1-1/4" from the outside of the cabinet. By examining the picture at the top of this page, you can see what I cut each strip at. The only tricky part is the interior holes on the speaker area.

A

B

C

D

Because we will be drilling from the top of the cabinet down, the holes in the speaker ledger will need to be angled. See pictures G and H for how I achieved this. You'll see what I mean when you start adding on the ledgers yourself. Other than this bit, the rest is very straight forward.

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E

F

G

H

Take the completed side off the saw horses, and replace with the other side. Repeat the above steps with this second side.

Now you can attach the base and monitor shelf. Then stand the shell upright to prepare for the next series of activities.

<<<-The Monitor Shelf **The Speaker Area->>>**

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5"
16"
6-X"
20"
14-½"
31"

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Cabinet Dimensions

Cabinet Plans 2: Speaker Area Start

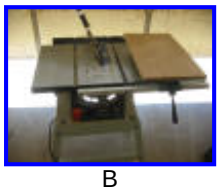
The Start of the Speaker Area

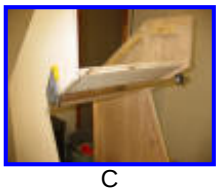
Start with a 20" wide x 12" deep board (A). You will be beveling one end, the end that will receive the marquee retainer. Take the board to the table saw. Set the bevel to 30 degrees and rip off just the end of the board (see B). You should end up with a board that is about 12" wide at its widest. Because a portion of the board will be hidden by the monitor glass, its fine if you end up with a narrower board than this. Just try to keep it over 11 inches.

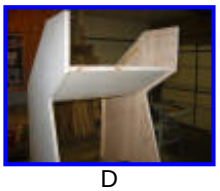
Note- We did not cut out the speaker holes yet due to not having decided which ones to go with. Because we will be disassembling the cabinet to paint, we'll just cut out the holes later on. The details of this process are ***later on in the document****. If you have your speakers already, feel free to cut out the holes prior to mounting.*

Next, fit it into its spot and prepare to pop some screws into it from the inside. I used a clamp to hold the board firmly in place (see C). This makes your life easier and allows for fine adjustments to its position before your screw it into place. Once you get it just right, screw 4 screws into it through the pre-dilled holes in the ledgers. It should end up looking like D through F.

A


B


C


D

E

F

Next up is the upper rear board.

<<<-The Ledgers Upper rear->>>

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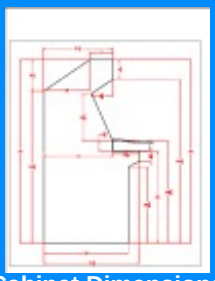

Cabinet Dimensions

Cabinet Plans 2: Upper rear board

The Upper Rear Board

Welcome to one of the more complicated boards to cut. Start by cutting a board 20" wide x 26" long. Both ends will be beveled so the resulting board will be less than this rough cut.

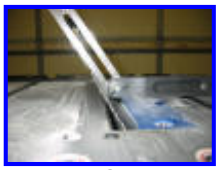
The top angle of the board is 40 degrees. Set the table saw to 40 degrees and trim off a bit off on end (see A). I usually cut off about 1/4" of length. The back angle ends up being 35 degrees. How I arrived at that was I used a handy little tool to mimic the angle (see B), then I transferred that to the table saw (C). The resulting angle showed as 35 degrees.

The finished length of the board should be 22-1/8". I took the board from picture A and **flipped it upside down**. I set the table saw guide at 22-1/8", then cut the board. You should end up with a board that is beveled on both ends like in picture E.

Next you need to place the board within the cabinet. I found the proper location by having Scott hold this board in its rough location while I took another 20" wide board and rested it where the top, marquee board would be. Once we decided it was located perfectly, we sunk four screws into it from within the cabinet (through the ledger board). You should end up with it looking like pictures G and H.

A

B


C

D

E

F

G

H

Next up is the back board.

<<<-The Speaker Area **Back->>>**

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Cabinet Dimensions

Cabinet Plans 2: The Back Board

The Back Board

Compared to the previous board, this one is a breeze. The only decision that you'll have to make is how much of your cabinet back so you want enclosed. We chose to leave enough open in the back to be able to slide Scott's PC out. This amount of opening also allows plenty of air circulation to keep the PC from overheating. We cut a board 20" wide x 31" long. Adjust the 31" measurement to your preferences.

We then clamped it into place (B), and drove four screws into it (C). The result is shown in picture D. See, it **was** simple!

A

B

C

D

Next up is the top of the cabinet.

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<<<-The Upper Rear Top->>>

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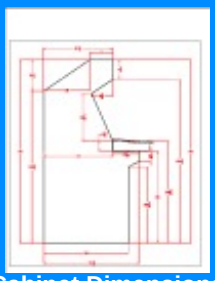
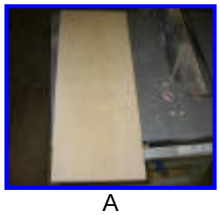

Cabinet Dimensions

Cabinet Plans 2: The Top

The Top Board

This is another simple board. Start by cutting a board 20" wide x 7-15/16" deep (see A). Next you can just place it atop the ledgers and admire your handiwork. We'll eventually be attaching a marquee retainer to this board, as well as the light, but that will be a little later. You should see a nice, sharp edge where the upper-back meets this top board, as in picture B.


A

B

C

Take a breather as the next step can be very aggravating. We'll be tackling the construction of the drawer on the next page.

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<<<-The Back Drawer->>>

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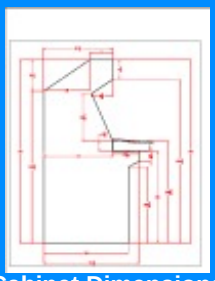


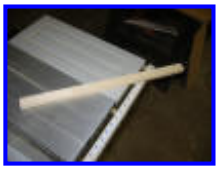
Cabinet Dimensions

Cabinet Plans 2: The Drawer

The Drawer

Before we build the drawer itself, we will want to add a 1" strip above it. This will keep the control panel support area from ever pulling apart and making the drawer stick. I used a similar design on my original cabinet and it has proved worthwhile.

Start by cutting a 1" strip 20" wide (see A). Locate it approximately 2.25" from the front of the cabinet. Use two small, one-inch "L" brackets to attach the strip. Use a clamp to hold it in place while you drive in the screws (as in picture B). When finished it should look like D.


A

B

C

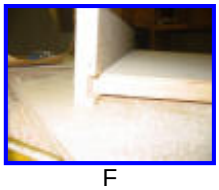
D

Now cut a board a board 19-7/8" x 3-1/4". This will be the drawer front. While you are at the table saw, cut a board 19-1/4" x 16" for the drawer itself. I designed the drawer proper to be glued into a slot in the drawer front. This will be very sturdy and be elegant, at least by my standards. Although there are no pictures, I cut the slot 1/4" from the bottom using a 3/4" straight bit. I cut it approximately 1/4" deep. You can see how the slot looks in picture F.

Note- The brackets that I used are 15.8" Euro-style, Self-Close drawer slides (Model KV1805) rated for 75 lbs that I picked up at Lowes.

Next, attach the drawer rails. You can see Scott trying to avoid (unsuccessfully, I might add) being captured by the camera as he was attaching the rails. After you attach the rails, attach the receiving rails inside the cabinet. I have no trick to installing them correctly; it took about four attempts to get them right and to slide smoothly.

E


F

G

H

Once you get the drawer installed correctly, it should look like pictures I through K. At some point during this process the drawer front was glued on and allowed to dry.

I

J

K

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The door is next.

<<<-The Top Door->>>

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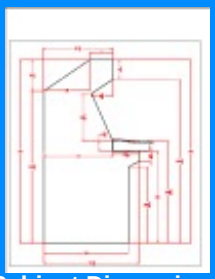


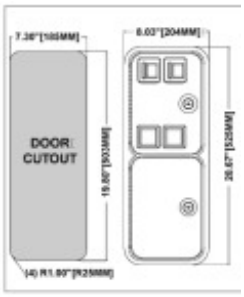
Cabinet Dimensions

Cabinet Plans 2: The Door

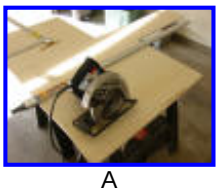
The Door

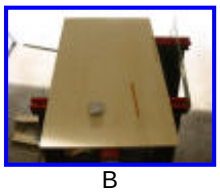
The next step to conquer is the front door, with the coin door cutout. Start by cutting out a board 30-3/4" long x 19-3/4" wide. We are allowing 1/4" gap for the hinges.

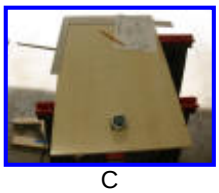
Once you have that cut out (as in B), you are ready to draw out the coin door cutout. Scott bought the Happ Over/Under Coin Door (see left) so we hit **Happ's site** for the cutout diagram. In case the link changes, I have included the important information to the right.

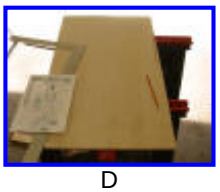


Without going into too much detail, I essentially centered the cutout on the door face. Picture D shows it all drawn out, with plenty of guidelines. I then used a 5/8" spade bit (you could use any bit large enough) at each corner so I could get the jigsaw blade through the panel (see E). I then cut out the hole with the jigsaw, taking my time to stay on the line. *Be careful with the rounded corners. Keep your cut to the inside of the curve or else you may leave a cut that is visible from outside the door.*


A


B


C


D

Now is the moment of truth. Place the coin door into the hole and hope it fits properly. As it happened, one corner was not rounded enough and you could see daylight through it when the coin door was in place. Hence, the note at the end of the previous paragraph. However, because the cutout was centered, I tried flipping it around. That worked and the fit was perfect. Whew!

Stand the door up and admire your work. Mounting the door and installing the door lock will have to wait until the cabinet has been painted and assembled.

E

F

G

Additional info: The coin door that Scott purchased came standard with yellow coin reject buttons on it. Yellow did not fit Scott's cabinet design so we ordered two replacement buttons in blue. They are part #42-0517-02

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Blue reject button assembly on **Happ's site**. In addition, Scott is going to use tokens, not quarters, to plug the machine with. Therefore, he designed some custom "push to reject" art for them. He designed them as 1 inch tall by 3/4" wide to fit perfectly. Scott has graciously provided them for your use below.

The next page revisits the speaker area where we will cut out the speaker holes.

<<<-The Drawer **Speaker Area Cuts->>>**

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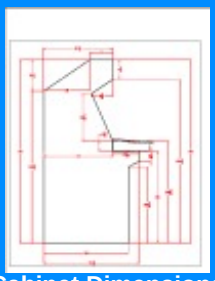


Cabinet Dimensions

Cabinet Plans 2: Cutting the speaker holes

Cutting the speaker holes

Before we move into the actual work, I want to point out how difficult it was for Scott to find some "plain-Jane" speaker covers locally. With everyone looking to "pimp their rides" I guess they are no longer sellers. Scott stumbled upon a gentleman at Circuit City who, upon hearing what the intended purpose was, let Scott poke through the box of parts that were being disposed of in the course of stereo upgrades. Scott found exactly what he was looking for, and the price could not be beat. Thanks Doug.

If you are using some other cutout design, then your measurements will differ but the general concept will be the same. As far as the circle is concerned, I hunted through the house for something that I could trace around that was the correct size. One of Alex's baby bowls ended up being the perfect size (see C).

The speaker holes should be centered front-to-back and side-to-side on the *viewable* portion of the board. Viewable is the key term here. Remember that a portion of the speaker board will be covered by the marquee retainer, and some will be hidden from view behind the monitor glass. To come to the viewable space, I placed the marquee retainer on the board about where it would be located permanently. Then I figured out where the board would begin to hide behind the monitor glass by placing it in the cabinet and marking the point where the glass would meet it. For my situation, the resulting number was 9-1/8" viewable (see B). Your number should be very close to that.

After that, I set about centering the circles within this area. I won't try to explain what I did but suffice it to say the end result was the circles were drawn on the board.

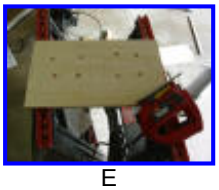
A

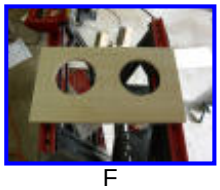
B

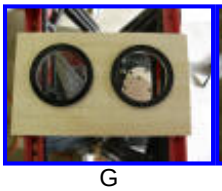
C

D

Drill out a couple holes within your circles (as in E). These will give you spots to drop the jigsaw blade down through. Now, taking your time, cut out the two circles. When finished, you'll have two nice circles (F). I have shown in pictures G and H how the speaker grills will fit. The right side is just the grill attachment, with the left showing the grill face in place. It will be a lot less 'see-through' once it is on the cabinet.


E


F


G

H

Now the cabinet is ready to be sanded, primed, and painted, so on to the next page.

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<<<-The Door Painting->>>

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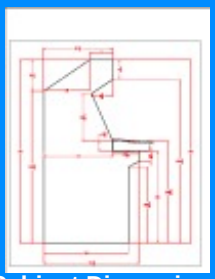

Cabinet Dimensions

Cabinet Plans 2: Painting

Painting- Step 1: Sanding

The first step in the painting process is to thoroughly sand the entire cabinet. Although the cabinet-grade plywood is fairly smooth already, it will benefit from some overall fine sanding. In addition, the edges of the wood will have chips and other "jaggies" from the cutting process.

Scott selected 240 grit and 400 (super-fine) grit sandpaper for the project. Using a sanding square (shown in A), he gave the all the pieces a good sanding with the 240 grit. The exterior sides received a buffing with the 400 to get them super smooth. Try to go with the grain whenever possible. *Note- You could save yourself some time and use a random-orbital sander or a belt sander. If you use a belt-sander, be sure to go with the grain.*

A

B

C

Painting- Step 2: Priming

Next up is to prime all the pieces. Scott purchased a quart of **Kilz** and it was just enough to prime both sides of all the pieces. Also purchased were a variety of other items to make his life easier (see D). You may or may not need them. Thoroughly wipe off all the boards with cotton cloths (old tee-shirts or socks work great) before beginning. A roller makes quick work of the job (see picture E). Scott primed all the interior sides first, let them dry, flipped the boards and primed the exterior sides. The Kilz dries fast so this process can be completed in about two hours.

D

E

F

G

Painting- Step 3: Painting

Give the primer a good six hours to dry before beginning to paint the **interior** sides of the boards. The key word in the previous sentence is **interior** (as Scott unfortunately found out the hard way). You'll want to set the good side down. I found that if you can round up enough saw horses, slap two-by-fours across them, it'll make painting the sides easier. If that isn't possible, I'd recommend resting each board atop a couple small scraps of wood, which is then atop plastic sheeting to keep your floor clean. The small scraps elevate the boards so you can see if there are any paint drips, which you can quickly wipe up.

Once you've set everything up, shake the paint well (before opening it,

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obviously). Then open the can and stir for a minute or two with one of the stir sticks you snagged from the store. You **did** grab a hand-full of them, right?

For the smaller boards, I used a 3" roller and a small foam brush. The foam brush is used to cut in around any ledger boards, and to paint the edges with a light coat of paint. Then use the foam roller to apply a thin, even coat to the boards, going **with** the grain. Make a final pass on each board to smooth out any bubbles.

For the interior of the sides, you can use a 9" roller where possible to make it go faster. Use a foam brush to cut in around the ledgers.

Let the first coat set until completely dry. This can vary greatly depending upon temperature and humidity. Once the coat has dried, apply a second coat just like the first. If two coats isn't enough, feel free to repeat with a third, but remember that you are painting the interior sides right now. I only painted a third coat on the inside of the door, and along the outside couple inches of the sides.

Let the boards dry at least overnight before beginning to paint the exterior sides.

Flip the boards so the good side is up (primed). We painted all the exterior sides except for the two side panels. We wanted to wait to paint the sides until we had assembled the cabinet. We didn't want to mar the paint when we used clamps to hold the cabinet together when attaching everything.

All exterior/top sides receive at least three coats. We did a fourth on the coin door. The exterior sides (which will be painted in the next step) will receive four as well. The best plan would be to let the pieces dry at least twelve hours after the final coat before assembly.

<<<-Speaker Area 2 **Assembly->>>**

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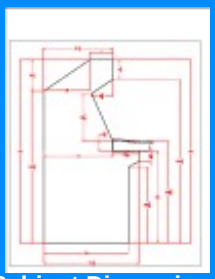

Cabinet Dimensions

Cabinet Plans 2: Assembly

Assembly

We began by laying out all the cabinet parts on the floor (see A). You'll next start with the left side of the cabinet. Place it inside facing up. Take the base and, facing it the correct direction, place it into the slot. It should snap in snugly. Try to hold the side at a 90 degree angle to the base as you drive the screws through the ledger into the base. We used 3" decking screws, and predrilled the holes out at this step to clear any paint from them. Be advised you might have problems getting this length of screw all the way in; we ended up trashing a few screws, but in the end was successful.

Next, take the monitor shelf and place it on the cabinet side. Keep it at 90 degrees as you drive the two screws into place.

A

B

C

D

Carefully stand the side up, and place the base into the slot of the ... To make sure you get the base seated exactly right, I suggest you use two of your long clamps (even though you only see one in my photo). Attach one to the front of the cabinet and one at the rear, and tighten them so that the outside dimension of the cabinet is exactly 21.5". Now you can drive in the screws for the right side of the base.

E

Next, you will work on attaching the other side of the shelf. Remove the two clamps from the bottom of the cabinet and attach them at the height of the shelf, front and back. Before making them snug, ensure that the cabinet shelf is in exactly the right position. Once you are sure it is, tighten the two clamps so the outside dimension is 21.5". Drive in the two screws. Next, you will tackle the upper-back, and back boards.

F

In order to get the rear and upper-back boards in place, we used several long clamps to get the cabinet squeezed together (G-I). We placed the boards to where they should be, then tightened the clamps so the outside measurement was 21-1/2". We used 1-1/4" screws to attach the boards. After that, we removed the two ledger boards that would support the top of the cabinet, and attached the speaker board from above (L). Finally, we reattached the two ledger boards (M). Throw on the top (N) and admire your work.

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G

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I

J

K

L

M

N

To the right are are three pics added in the middle of this page, "just because".

Caster Attachment

In order to attach the casters, place the cabinet (carefully) on its side. You can use any length screw; we used 1-5/5" because they were handy. We chose to use two swiveling casters for the front, and two stationary ones for the back. I learned from my first cabinet that by using four swiveling casters, it makes moving the cabinet a little harder. Since then, I've used this strategy and it has worked better. Feel free to do what you think best. Center the casters on the 4" wide board. Set them back about 4-5" from the rear. Drive in the four screws. Repeat for the front, making sure that when the wheel is swiveled all the way forward it does not hit the (future) door. See picture P for how we checked this.

O

P

Q

1" Strip

Stand the cabinet up. Next, install the 1" strip at the front of the cabinet, above the drawer. This is attached with a small L-bracket. You might want to take a clamp and tighten the area to 21.5" (outside dimension) before attaching the strip.

R

S

Drawer

Attach the drawer slides to both the interior wall, and the drawer itself, using the predrilled holes (remember the ones we drilled before painting?) as a guide. Slide in the drawer and this step is complete.

T

U

V

W

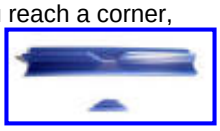
Door
Note- Make sure you know which side if up on the door before you begin. This is rather important.

A little comment about how we arrived at our choice of door hinges. We purchased ____ to use but discovered two things. First was that two college-educated men couldn't figure out how to actually install them. The second was that the hinges snapped nastily and nearly removed parts of our fingers. With this being in a home with children, that was a liability. What we fell back on was the tried-and-true piano __" hinge. This was almost exactly the length of the door so we quickly screwed the hinge to the door edge, then attached the other side of the hinge to the cabinet wall. We made sure that the door would open and not hit the bottom of the drawer face. There is not tried-and-true calculation of placement; you'll just do it by eye.

We will install the door lock and L-bracket to keep the door locked shut later on in **Finishing Touches.**

Paint the sides
At this point, we stopped assembly and Scott painted the two exterior sides. We did this last so that the clamps we used during the assembly process did not mar the beautiful paint job.

T-Molding
Scott attached the blue T-molding after allowing the cabinet sides to dry overnight. T-molding is best installed with a rubber mallet, and a sharp knife. The method I've found that works best is to start at the lower back on the cabinet and start pressing the molding into the groove with your fingers. Get a length about 4" partially pressed in, then go over it with the rubber mallet, working from the starting end forward. Repeat. When you reach a corner, you will need to remove some of the inside of the molding, which is called notching. Essentially you remove a 'V' of material so that the molding can go smoothly over the corner. See the right for a visual example.



Continue working in this way until you complete one side. I did not add molding to the 'L' of the control panel support area. One side down, repeat for the other side. Wipe it all down when you are done with a damp cloth and you are ready to move on to the next step, adding the speaker grills.

Speaker grills
Scott purchased a bit of black acoustic fabric like the kind on the front of home stereo speakers. He cut off a section that was large enough to cover both speaker holes from the inside. He then attached it with a few small screws on the inside of the cabinet, covering the holes. Next, he attached the speaker grill surrounds to the front of the cabinet, making sure that the cutout was centered within the grill. Then he snapped the grill face plates in place. The speakers were put into place with Velcro. We have no pictures of this process but it was much like the descriptions at the bottom of the **Original Plan's Speaker page**.

X

Y

Z

a

Monitor
Scott used a 19" LCD in this cabinet, left on its stand. He found the perfect placement for it on the monitor shelf, and then placed two shims under the front legs to ensure the monitor's face matched the angle of the cabinet perfectly, so that the glass would be equidistant the whole way. He then secured the base in place so it would not move. I hope to have a picture of this at some point soon.

Coin door mounting
The final step on this page was to install the coin door. We will wire it up later on in this document on the **Finishing Touches page**. The coin door installation is straightforward. Just follow the directions included with yours and you'll be all set.

Next up, we'll tackle the marquee area.

<<<-Painting **Marquee->>>**

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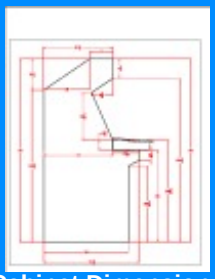


Cabinet Dimensions

Hi-res Marquee (.PDF)

Cabinet Plans 2: Marquee

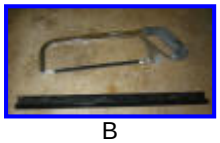
Marquee

To start, take your marquee retainer strip and cut two 19-7/8" strips. A hacksaw works great (see A and B). Use a little 220 grit sandpaper to smooth the ends.

After that, you will need to cut two pieces of plexiglass which will be used to sandwich the marquee art. We used 19-7/8" x 7-1/2" as the size, which we arrived at by physically measuring the area it was to go into, and subtracting 1/4". Scott used a straightedge and X-acto knife to make these cuts (C). Take your time. The best method is to score one side by going over the line with your blade multiple times until you get about half-way through. Then place the waste end over the edge of the table, with the score line on the edge. With firm pressure, snap the plexi along that line. Be careful- the cut edges of plexi are **extremely** sharp.

Next is time to attach the light to the underside of the cabinet's removable top. Just follow the directions that comes with your light, and make sure to both center the light left-to-right, and to face the light output to the front of the cabinet. Pretty straightforward (see D).

A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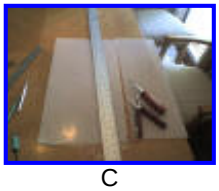
C

D

You can test the light by putting the board in place, and firing it up.

Now it is time to attach the two marquee retainer strips to the cabinet. Take your first retainer strip and place it on the top edge of the speaker board, the 'cup' facing up. You'll want to leave about 1/4" of gap at the end to handle the plexi pieces. Pre-drill two holes through the retainer and into the speaker board, trying hard to make them symmetrical. Use two screws to attach the retainer, preferably black. If you don't have black screws, a Sharpie can work wonders for you after they are in place. Scott used this method for the same screws as on the speaker grills. Mount the other retainer strip to the (removable) top board using a similar process. Just be sure to have the 'cup' facing down this time. Once you have finished this step, feel free to test out your marquee. Just sandwich the art between the two pieces of plexi (after Windexing them clean). With the top of the cabinet off, put the bottom edge of the sandwich into the lower retainer. Then carefully place the top board. It might take a bit of finagling to get it in place but once it is, it won't be moving easily.

Stand back, flip on the light, and enjoy your handiwork.

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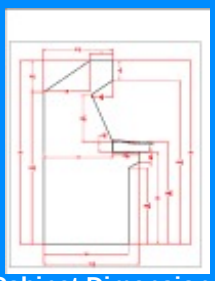

Cabinet Dimensions

Bezel Artwork (Adobe Illustrator file)

Cabinet Plans 2: Monitor Bezel

Monitor Bezel

Scott designed the monitor bezel for his cabinet. He took graphic elements from Space Invaders, Tron and Defender to create the retro look. Before he set about creating the final design, he measured both the glass **and** the monitor face while it was mounted in the cabinet. The 1/4" glass was 19-3/4" wide x 22" tall. Once he measured the monitor face, he calculated he would need 2-5/8" border on each side, 4-3/8" border on the top, and 6" border on the bottom. This gave him the measurements needed to get started. He worked up the graphic in Adobe Illustrator and had it printed locally (Capitol Blueprint), oversized in color. *The artwork file is available on the far left of this page.* He then purchased a neutral gray (with black core) 3-ply heavy matte board from Michaels that he mounted the artwork on, using a spray adhesive. The black core was important for when he cut the bezel at 45 degrees for the monitor to show through, the black core blended nicely into the monitor face. The heavier board made it sturdy to hold up against the glass when pressed together.

The series of photographs (A through G) show the process just described, with the final picture (H) showing how nice it looks when in place. For your information, the graphic cost $23.50, the matte board $15, and the glass $16. The final look.. priceless.

A

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<<<-Marquee List of Boards->>>

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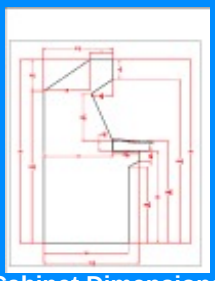

Cabinet Dimensions

Cabinet Plans 2: List of Plywood Boards

List of Plywood Boards

I have listed all the plywood boards required to build the cabinet. Each board is linked to the page it is used on, to make your life a little easier. I did not list the ledgers as it is not that critical to have them be exactly the same as mine. Besides, they are listed on a single **page** already.

Plywood Boards	Dimensions	
Side Panel [2]	See Page	
Base	20-3/4"w x 30-15/16"	
Caster strips	4" w x 30-15/16"	
Monitor Shelf	20"w x 14-1/2"	
Speaker Area	20"w x 11-1/4"	30° beveled
Upper Rear	20"w x 22-1/8"	40° and 35° bevels
Back	20"w x 31"	
Top	20"w x 7-15/16"	
Front strip	20"w x 1"	
Drawer Base	19-1/4"w x 16"	
Drawer Front	19-7/8"w x 3-1/4"	
Door	19-3/4"w x 30-3/4"	

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<<<-Monitor Bezel Control Panel Intro->>>

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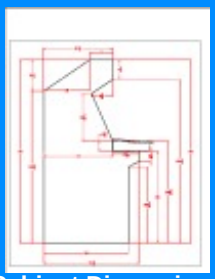


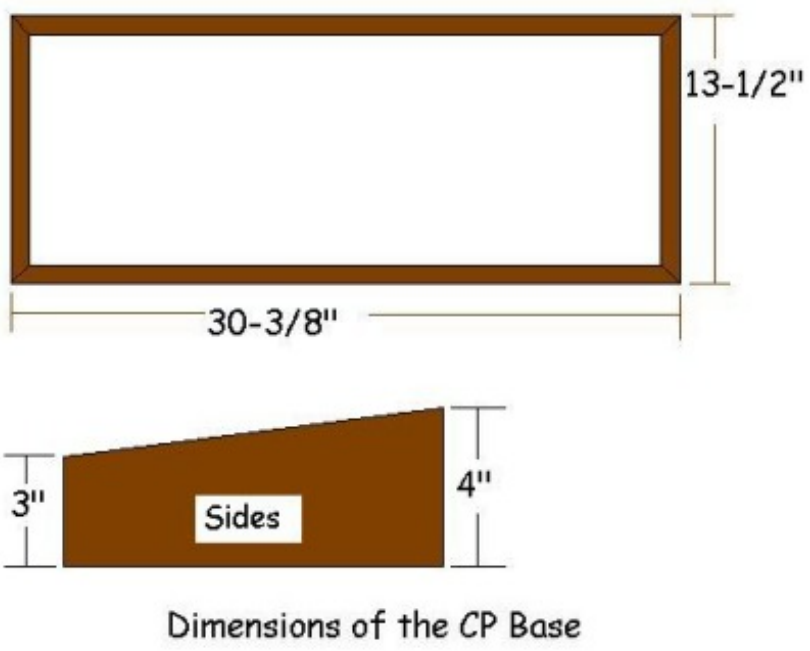
Cabinet Dimensions

Cabinet Plans 2: Control Panel Intro

Control Panel Intro

The next step is the control panel. I've broken this process into several pages. This first page will explain how to construct the CP shell. The next page will detail the drilling of all the holes for the parts, and the third page gives some explanation how to wire it all up. For the shell, I used the router, table saw, drill, and jigsaw.

Note- *Because Scott is going to paint the control panel base, too, I didn't want any exposed plywood edges on the base's sides, so all four corners are mitered at 45 degrees. This makes the construction a little more complicated than if simple butt-joints were used. There are several more cuts and the measurements of the front and back boards are a little different. Therefore, I have created two distinct sections for the* ***mitre*** *and* ***butt-joints****. After that everything is the same with the construction.*



Dimensions of the CP Base

Mitre Joints

Begin by cutting two 4-1/4" strips at least 33" long for the back and sides. Cut one 3-1/4" strip for the front at least 33". See pictures A through C.

Set the table saw to **45** degrees. Take one of the 4-1/4" strips; this'll be for the two sides. Keeping the good side of the board facing up, cut two 16" strips off. Take the first 16" strip you cut and flip it so the beveled side is facing the saw guide. Cut it 13-1/2" long. Take the second board and turn it so the good side is up and the upward facing bevel is against the saw guide. Cut it using the same 13-1/2" measurement. You now have two side boards that look like D, and should be exactly the same (see image to the right).

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Next you will need to cut the bevels on the front and back pieces. This ended up being a little trickier as my table saw's guide allows up to 20" only. So I used the miter guide. With the table saw set at 45 degrees still, place the front strip good-side up on the table so the blade will cut about 1" off the end. Carefully make the bevel on the front board. Then make the first bevel on the back piece.

Take the front board (keeping the good-side up) and measure 33-3/8" from the end and draw a line. You will cut along this line, interior side down. You can save a little effort by running both pieces through at the same time, making sure the ends opposite the blade are exactly aligned. Now you can skip the next section and go to cutting the side slopes.

E

F

G

H

Butt-Joints
You'll need one 4" wide strip at least 27" long, one 4" wide strip at least 30" and one 3" strip at least 30". Take the 27" strip and cut into two pieces 13-1/2" long. These are the two sides. Take the 3" and 4" strips and cut at 28-7/8". These will be the front and back boards. That's it for the butt-joint text.

Now you'll begin to create the slope on the two sides. You'll be going from 3" at the front to 4" at the back.

Slope for the two sides
Take one of the two side boards. Measure up 3" on one end and mark the point. On the other end, measure up 4" and mark it. Draw a line connecting the two points. Take your jigsaw, and using a straightedge as a guide, cut along the line. Repeat for the second side. With some sandpaper, smooth any rough spots along the cut. You should end up with two boards like the one to the right.

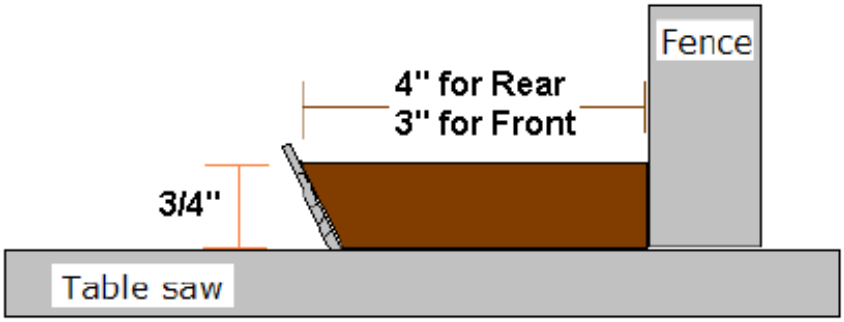
Create the bevel on the top of the front and back boards
The slope of the sides (one inch from front to back) necessitates cutting a bevel on the front and rear boards. I determined the angle by using the handy contraption in picture I and transferring it to the table saw (J). It ended up being 4 degrees (K).

I

J

K

You'll want to now measure up 3/4" on the saw blade and over 4" for the rear board to determine where to set the fence. You are essentially trimming off a little bit of wood. Check the below diagram for what I mean. Once you've made the two cuts (one for the front and one for the rear board) you are ready to work on the bottom board.



Base

You will need to cut a piece of plywood for the bottom that is approx 12" x 28-7/8" (you'll note ours is not exactly that- use the dimensions you need). We used 3/4" ply because we had plenty on hand. Feel free to use 1/2" if you want.

Next you will need to cut some ledgers. I used some scrap 1"x1" pieces and cut them into ledger strips. Now you're ready to begin the base assembly. Lay the plywood bottom on your work surface. Test fit the four sides around the bottom making sure that everything will fit tight when assembled. Get your clamps out and attach them to the box to hold it tight (see L). We cheated and used corner irons (see M) to attach the sides together. We predrilled and screwed one per corner (N). Now you can begin attaching the ledgers as in O and P.

L

M

N

O

P

You should now have a nice box constructed (see Q). Now would be the perfect time to cut out a hole on the backside of the box to allow the (eventual) cables to exit. I let Scott determine the location of the pinball buttons on the side. We did this by having him locate the proper position by feel and having me mark the center point of the right side. We then transferred this measurement to the left side. Using a 1-1/8" spade bit, we drilled the two holes. The method that works best for me is to start from the outside and drill most of the way through the board. Then switch and finished drilling the hole out from the inside. This keeps splintering to a minimum, and always on the inside if there is any. Now you are finished with the base for a while. Set it aside in a safe location. We'll use it a little later on.

Q

R

S

T

Top
To begin we cut a plywood board 33" x 16-1/2". In our situation I already had a template on hand from pervious panel builds. We traced the outline of the panel, then used a jigsaw to cut close to the line. Then we clamped the template to the top of our rough-cut panel, and used a flush-cutter router bit to smooth everything.

If you do not have a template lying around, take your time and draw a shape on the board that is pleasing to you. You can cut it out using a jigsaw, following the line closely. Smooth the curves with sandpaper.

Next, you will use the **slotter** to cut the T-molding slot. You should remember the process from when you routed the two cabinet sides, but in case you don't, here is the text again. You will need to center the cutter in the middle of the plywood edge. The plywood that I had was seven-ply, so this task was simple. I adjusted the router height until the cutter was perfectly aligned with the fourth (middle) layer. I then tested it on a scrap(!) piece of plywood, snapping a small piece of T-molding into the groove to make sure it was perfect. Once I decided it was, everything was tightened down again on the router and the first side was slotted. As always, move from left to right when using the router (just like reading a book). I slotted everything except for the bottom. Be careful to keep the router flat against the plywood surface at all times.

The next page will show you how to make the cuts for all the arcade parts.

U

V

<<<-List of Boards **Control Panel II->>>**

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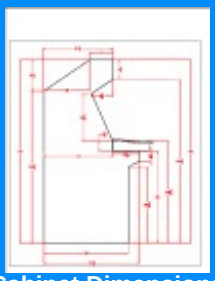


Cabinet Dimensions

Cabinet Plans 2: Control Panel II

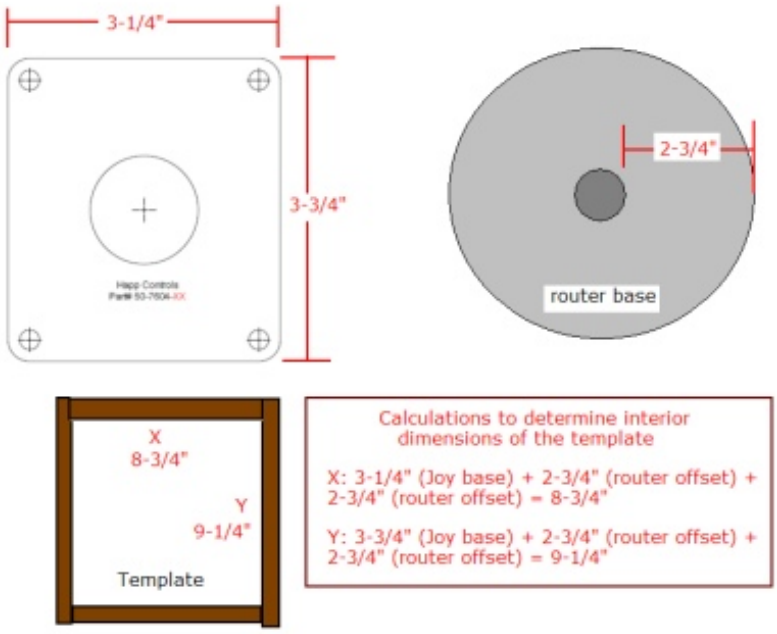
Control Panel II

Scott decided on the following items for his control panel: two Happ 8-way Competition joysticks, a **J-stick balltop joystick**, a **GoovyGameGear Tubospinner**,

Template for routing for joystick

I always route out underneath the control panel for each of my joysticks. This gives them additional height. For the first time I constructed a template to make my life a little easier. If you don't feel a need to build this template, feel free to skip down to the next section on **layout**. I provided this instruction for any interested parties.

Below is a diagram of how I arrived at the interior template measurements.



Basically what the diagram shows is that I measured from the outside edge of the 1/2" straight bit that is in the router to the edge of the router base plate. A picture of this measurement is to the right. The template will be for the router base to bump into and ride along, so the cut ends up being perfect.

I took a piece of 3/16" masonite (hardboard) and cut a 14" square piece from it (see A). In the middle of the resultant board, I created a square with the measurements from the above diagram (8-3/4" x 9-1/4"), and drew it with a Sharpie (see B). Next, I cut the square out with my trusty jigsaw, after first drilling two holes in the middle (C) for the jigsaw blade to get through initially. Next, I cleaned up the hole with a bit of sandpaper. Now I had the template built and ready to use a little later.

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A

B

C

D

Layout

You can now take the control panel top blank you cut previously and layout your controls on it. I'd recommend first taking the base and lay it atop the panel, just like it would be placed when attached. Then draw a line around the box. Remove the box, then draw a box **within** that box, in one inch. What this will do is give you an area that is no-man's land- nothing can be placed where it would touch this line.

The PDF document that I use for the various Happ templates is this **trusty one** you might recognize from my original **control panel page**. I do a ***Select...*** on each image I need, then print them each out, keeping 100% scale. I then cut these items out with scissors, and tape them to the panel blank. Play around with the layout until you are happy, then take each item down well with a couple pieces of tape.

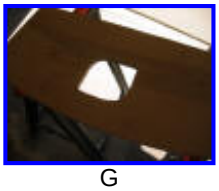
My strategy is to take a drill loaded with my **1-1/8" spade bit** and slowly start each button hole. Get it centered exactly right, and drill down just enough so you'll easily be able to find the hole when you remove the paper. If you drill too far you'll shred your paper template, and we don't want to do that quite yet. Do the same with the center of each joystick hole (for the shaft). Finally, take a 15/64" bit in the drill and start to drill a hole in each corner of the joystick mounts for the bolts. With a 13/64" bit, do the same with the four trackball bolt holes. After you've done that, you can remove the paper pieces (see G) and finish drilling through each bolt hole. You also drill through the four bolt holes of the trackball template. At this point you'll have many partially drilled button holes we'll clean up in a little while.

Trackball hole

Now you are faced with drilling out the trackball hole. Drill a few 3/8" holes along the edge of the line you drew (see E). These will provide you a way of getting the jigsaw blade through. Then carefully use the jigsaw to follow your line as closely as possible (F). You should end up with a hole shaped something like G shows. *Note- Although this hole's shape appears goofy, it fits both the Betson and the Happ trackballs perfectly.* Test fit with your trackball and use the jigsaw to clean up any problem spots. The trackball should fit snugly.

E

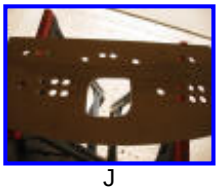
F


G

To finish each button hole, drill through most of the way from the front, until the center spike pops through the backside of the panel. Then flip the panel and drill from the backside until you are mostly through. Finally, flip it back good-side up and finish drilling through for all the button holes. This sounds complicated but is obvious once you begin. H through J shows the process.

H

I


J

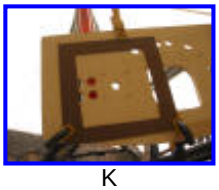
If you have any side pinball button holes like we do, drill them the same way.

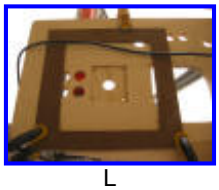
Routing the joystick recess
In order to gain a little more joystick height, you will need to route the under side of the joystick hole. I will describe how I did it using the template we built at the top of this page.

The first thing I do is flip the control panel top over. Take a joystick base, and align it up with the four bolt holes you drilled through the top. Once you have it aligned, use a pencil and draw around the joystick base, then set the joy base to the side. You'll use this pencil box to align the template.

Mount the 1/2" bit in the router (see M). Now set the template down over the box and try to center it. Take the (unplugged) router in the other hand, with the 1/2" bit extended 3/16". You'll need to take the router and align the far right of the bit on the right side line of the box. The outside of the router base will show you where the template should sit. Shift the template as needed. While holding the template in place, move the router to the topside and determine where the top of the template should sit. Recheck the right side. When happy, clamp into place with two clamps (see K).

With the template securely clamped in place, start the router up in the open center hole of the joystick area (simply, the dead center). Take your time, and slowly remove all the material within the lines. The router's base should ride nicely along the template's interior. When done, brush out the dust, and route out any leftover material. Test fit the joystick's base. It should fit snugly, and the bolt holes should line up perfectly. When satisfied, repeat the process with the other joystick areas. It took me less than five minutes per recess.


K


L

M

N

O

Mounting T-nuts to allow laminate or other covering
My original control panel has exposed joystick bolts. This is acceptable for a painted top but you might wish to recess the bolt holes if you are laminating or covering the panel top at all. Most of my subsequent projects have been laminated, with hidden bolts. As Scott was going to use vinyl, we did the same.

You'll need 3/4" T-nuts, a 3/4" spade bit, and 3/16" x 1/2" bolts to handle this. For each bolt hole recess, you'll take the spade bit, center it in the bolt hole from above, and carefully drill down about 1/16". ***You may want to practice on a scrap board first.*** Then you press the T-nut into the hole, and give it a nice little whack with a rubber mallet (or hammer). The Tee-nut will pull down tight once you place the joystick base beneath and screw in the bolt snugly.

P1- (Tee nut and bolt, unassembled)

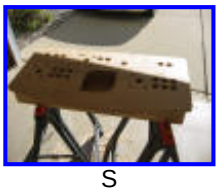
P2- (Tee nut and bolt, assembled)

P3- (Tee nut and bolt, assembled)

Q

R

Pictures S thru U show the top with all the holes finished sitting atop the base. It is really looking like something now.


S

T

U

Laminating

If you wish to laminate the control panel, I provide very detailed instructions in my **Ultra-trackball control panel PDF**. I won't repeat myself here.

Vinyl

Scott used a heavy-duty blue vinyl that he found at a local fabric store, of all places. He chose to paint the remainder of the control panel box, to match the cabinet itself. Refer to the **Painting** page for details of his painting process.

After everything had tried for a couple days, he began handling the vinyl. (***Note- He first attached all the T-nuts and screwed them tight with the bolts. The Tee-nuts now weren't going anywhere.***) Scott rough-cut the vinyl to the control panel top (see X). Using an x-acto knife and scissors, he carefully scored and cut out each hole. Once done, he attached the vinyl to the top with adhesive, being careful to align the holes. He used a roller (see 1) to smooth out all the bubbles, moving slowly from one side to the other. He then cleaned up any imperfections, and was ready to attach the hinges.

V

W

X

Y

Z

1

Hinges
We just used plain old cabinet hinges to attach the top to the base (see 2). We placed the hinges on the front edge of the base so that the top pivots up toward you, so you must go behind to see the innards.

2

Now we can move on to wiring the control panel.

<<<-Control Panel Intro **Wiring the CP->>>**

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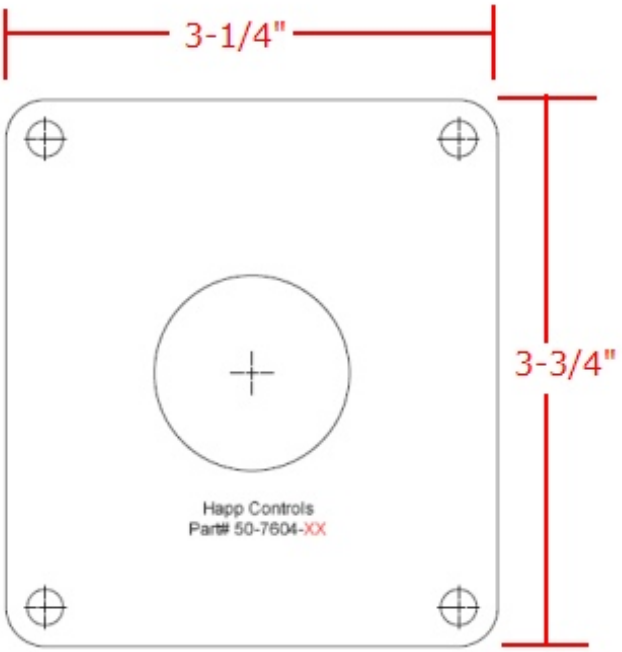
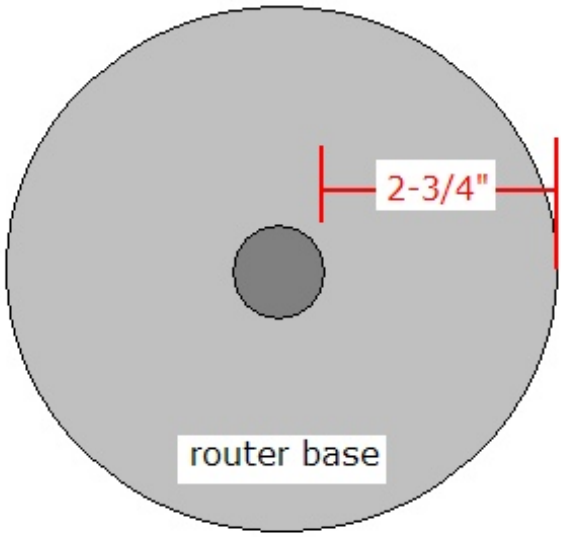
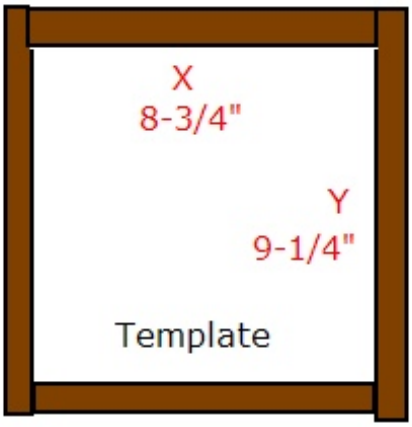






Calculations to determine interior dimensions of the template

X: 3-1/4" (Joy base) + 2-3/4" (router offset) + 2-3/4" (router offset) = 8-3/4"

Y: 3-3/4" (Joy base) + 2-3/4" (router offset) + 2-3/4" (router offset) = 9-1/4"

Cabinet Plans 2: Wiring the CP

Wiring the CP
Overview
Allow me to start this page with some basic descriptions of how each step will be done. We have used the standard Happ buttons and Competition joysticks in the control panel. They use a standard Cherry switch, which is wired with 22 gauge stranded wire inserted into a .187 quick disconnect. Pictures A through D show each of these items.

A) Happ button with Cherry Switch

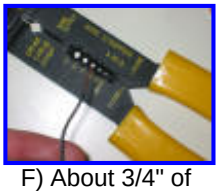
B) Cherry switch in place

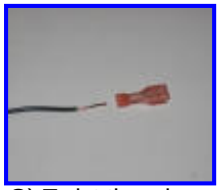
C) .187 quick disconnect

D) Everything with wire cutters

E) Close-up of the cutter and 22 gauge stranded wire

There will be two wires going to each Cherry switch, the unique wire and the common ground. The method I use for the unique connection (where the wire goes directly from the I-pac to the switch) is shown in F through K. I strip off about 3/4" of insulation from the wires end (F) then twist the strands together tightly (G). In order to make the best connection, I double the wire ends upon itself (H), then insert into the disconnect (I). I squeeze the end together so there is no chance of the wire working its way loose. This process has never failed me yet. Finally, connect the disconnect to the Cherry switch (K). *Make absolutely sure your connection looks the same as mine does in K.*


F) About 3/4" of wire being stripped of the insulation


G) Twist the wires tight

H) Double over the wires...

I) ...and insert into the disconnect

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J) Squeeze the end a bit to tighten it

K) Attach disconnect to the 'unique' input

The common ground wire will be daisy chained from button to button, connecting to all the buttons and joystick switches, finally terminating at the ground connection on the I-pac. I take the two wire ends (L) and twist them together tightly (M). I don't double the wires over this time as they are thick enough as-is. Just insert into the disconnect (J) and tighten it with the cutter. Then attach the disconnect to the common ground input on the switch (O). You would do this for each switch except for the very first in the chain. That first switch (the furthest switch from the I-pac) would receive just one wire going into the ground.

L) Start with two ground wire ends

M) Twist wires together

N) Insert into disconnect and crimp with cutter (as in J)

O) Attach to common ground on switch

P) Another view of the common ground connection

Wire the panel

Now that we have covered the basics, we'll start detailing how to wire the entire control panel. Below is the image of the **Ultimarc I-Pac** that we used.

The Ultimarc I-Pac (click on image to see rotated view)

For reference, the next diagram is how the control panel will be connected to the I-Pac. Click on it for the larger, clearer image. Note that I do not show the trackball connections, nor the common ground that snakes from switch to switch. One last item to note is something I left off for image clarity (the lines are hard enough to follow as it is). The switches on player one's joystick are mimicked on the 4-way joy at the top-center. Just like you see the red line going from the I-pac's SW-1 to the control panel button and on to the fire button next to the 4-way's joy, so will each of the four directional switches be. Hopefully that makes sense.

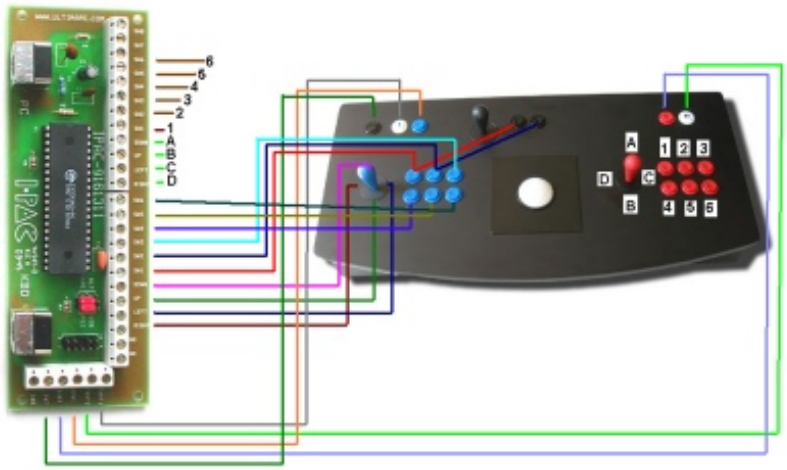


Diagram of how the buttons and switches are wired to the I-Pac for the ArcadeCab Control Panel Layout

It is usually easiest for you to install all the joysticks and buttons in the control panel first. Then go around and add the cherry switch to each button. The joysticks should have come with the switches installed but if not, install them next.

Q) Mounting the trackball

R) Attaching the buttons

S) Attaching the Cherry switches

Next, determine where you will place the I-pac. There are several items to consider when you are determining placement. First is you will need a location close to the exit hole on the rear of your control panel base. This is to allow the cable from the keyboard to attach to the I-pac, as well as allow the cable FROM the I-pac to get out and connect to the PC's keyboard input. Secondly, you'll want the I-Pac somewhat centrally located so wire lengths are similar. Lastly, does your control panel's top hinge open? If it does, you might want to locate the I-pac close to the hinged side. The reason is when you open the top, the cables from the keyboard and PC will be pulled inward. The closer you are to the hinge, the less the cords will be pulled.

Once you have determined placement, go ahead and mount the I-pac to the wood. You can either use PCB mounting feet or just simple washers to elevate the I-pac above the wood a bit (see T). The reason you need it elevated is that there are solder points on the backside of the I-pac that make it sit awkwardly. In addition, it's not good practice to put pressure on these.

T)

U)

Now that the I-pac has been mounted as in U, you are ready to begin wiring the panel. Gather your bag of .187 female disconnects and wire cutters (see D), and your spools of 22 gauge stranded wire. A beer might also be nice to have at the ready as this will take a little while to complete.

Something important to note is that the joysticks appear to be wired opposite. When you press right on the joystick, the switch that is triggered is

actually on the LEFT side of the stick, not the right. Same with the other three directions. Just keep this in mind as you wire.

The steps to wire each switch to the I-pac are as follow:

1) Cut correct length of red wire to get from the I-pac to the switch. Allow about two to three inches extra to play with.
2) Strip 1/2" of insulation off one end and 3/4" off the other.
3) On 3/4" end, twist the strands, double over, insert into disconnect and crimp it tight (as in F - J).
4) Insert disconnect onto switch (see K).
5) Insert other end of wire into correct I-pac terminal (see wiring diagram) and tighten terminal down snugly with screwdriver.

You do this for all the switches. After this is completed, you should be done with your beer. Go get another cold one as it is time to begin daisy chaining the common ground. Start at the upper right of your panel (in ours that is the player two start button). Take the black wire and cut off a small length, maybe three inches. Strip off 3/4" from both ends. On one end, twist the strands, double over, insert into disconnect and crimp it tight (as in F - J). Insert disconnect onto switch (see K).

Example ordering of the common grounds

From now on, all the remaining switches will have two wires going into them (as in N). You will cut lengths of wire adequate enough to make it from one switch to the next and attach each wire like shown in L through P.
The order than I connect the ground switches is shown in the diagram below. Feel free to wire them however you choose- this ordering just tends to work well for me. If you have additional buttons, such as side pinball buttons, feel free to insert them into the ordering where it makes sense.

At this point, your wiring is almost complete. Attach the cable from the keyboard into the input on the I-pac, and connect the output cable to the keyboard-in on the PC.

If you have a spinner, like we did, connect it to the PC. Finally, if you have a trackball, you will need to connect it.

You should be ready to test the buttons and joys. Hook up the panel to your PC and just test each and every button and joy to ensure everything is wired up fine. If anything doesn't work, now would be the time to debug.

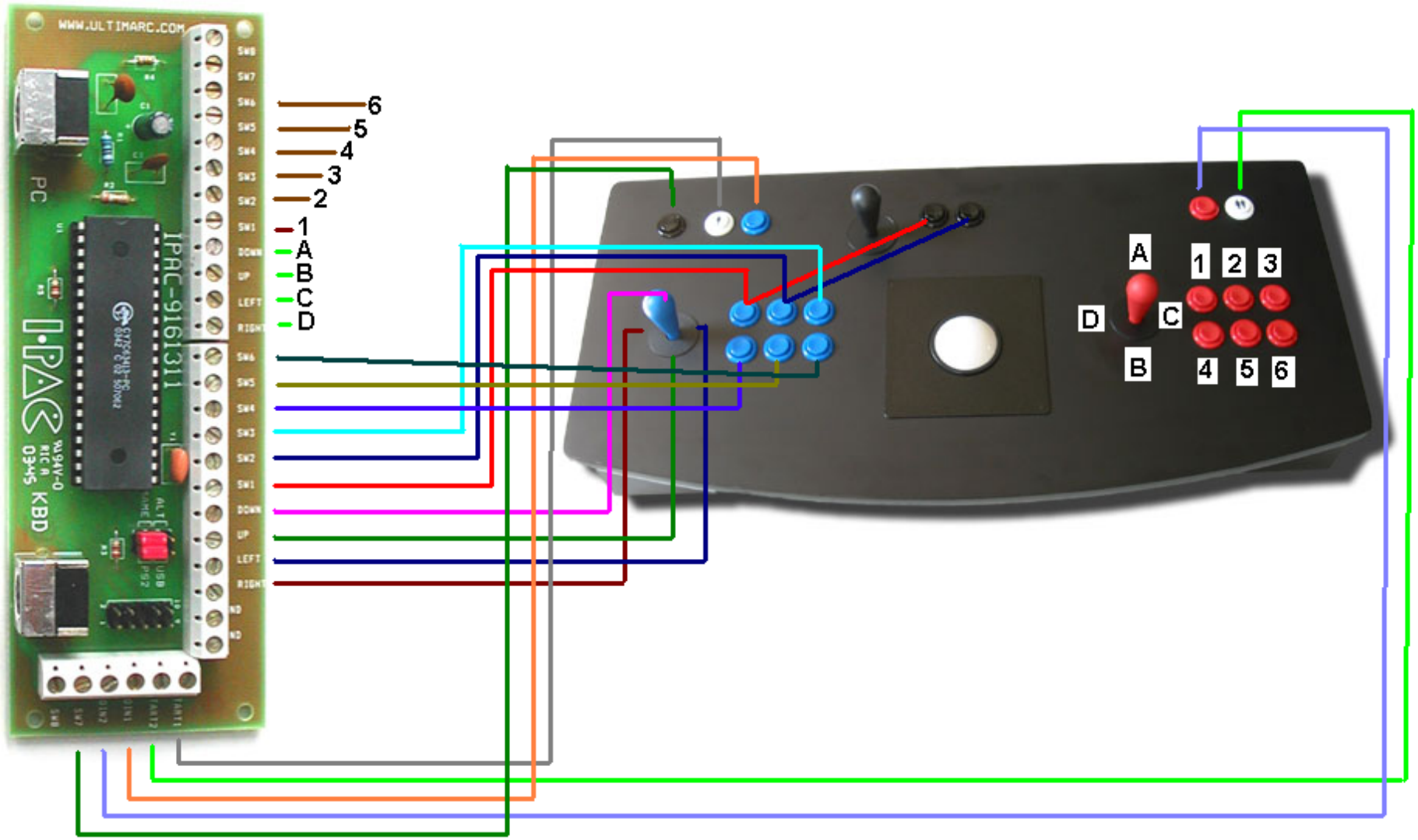
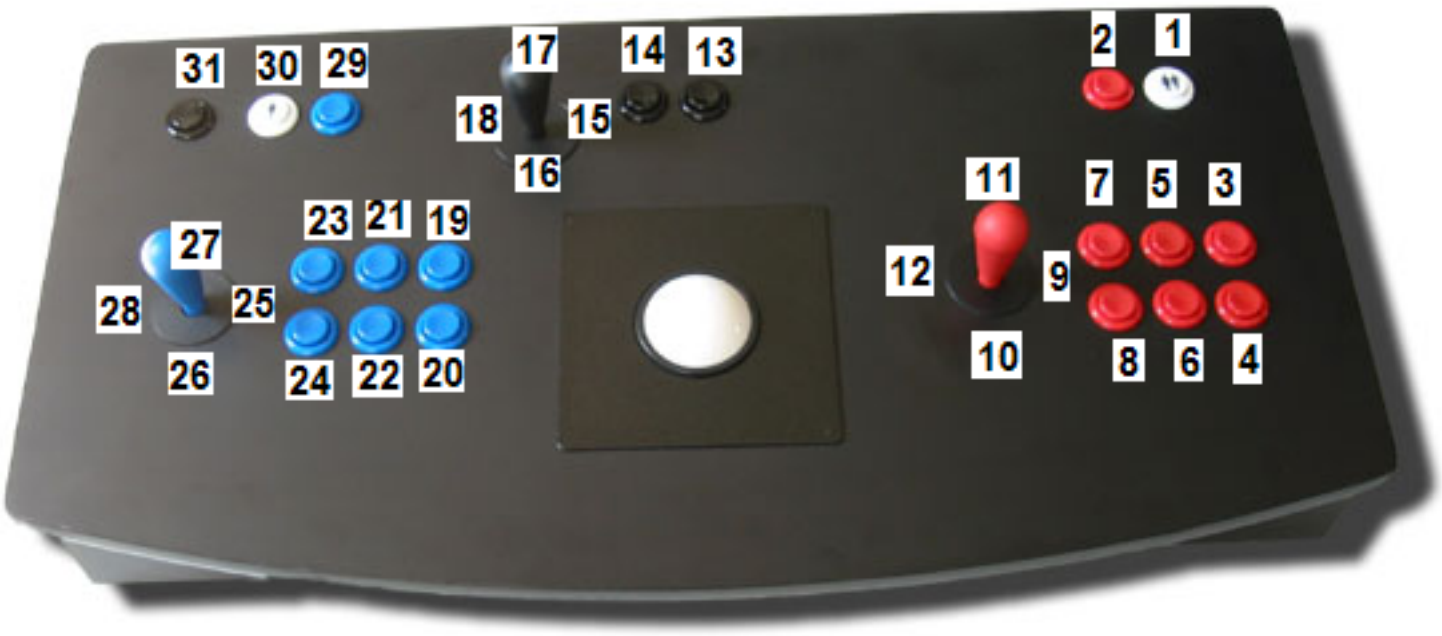


Diagram of how the button and joystick switches are wired to the I-pac for the ArcadeCab Control Panel Layout

Note- The trackball connections are not shown. None of the grounds are shown. The 4-way joystick at the top is wired in series to the Player 1's 8-way joystick switches.



Example ordering of the common grounds

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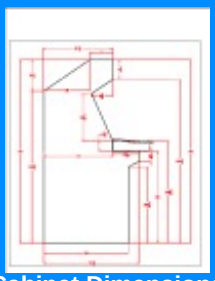
Cabinet Dimensions

Cabinet Plans 2: Attaching the CP

Attaching the CP

You can do this a variety of ways. The method we employed was to just use 4 smaller L-brackets and attach the panel from the inside, with the brackets being hidden by the keyboard drawer. You could get away with just two brackets; four just makes it a little more solid.

Next up are the finishing touches.

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<<<-Wiring the CP Finishing Touches->>>

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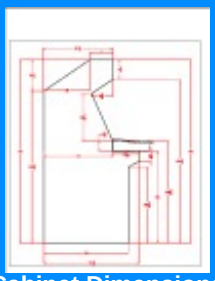

Cabinet Dimensions

Cabinet Plans 2: Finishing Touches

Finishing Touches

Now that you have the cabinet constructed, you can attach your coin door, order and install your marquee, create your monitor bezel, etc. You are limited only by your imagination. Scott designed sideart and had it printed by a local sign company to add to the effect. I have seen cup holders added and neon lighting at the base.

Check out the page of **Visitor's cabinets** for further ideas, as well as the many projects on the **BYOAC** forums.

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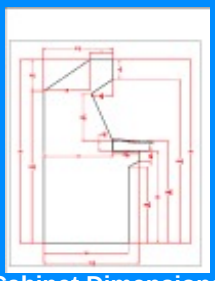

Cabinet Dimensions

Cabinet Plans 2: Software

Software

I use **Mamewah** for my front-end. You can find out how I installed it **here**.

Most of the persons working from my plans will be at least using MAME to play games. Jeff at **Monstarcade** can get you the roms you need to play the games, as well as all the Laser Disc games (think Dragon's Lair and Space Ace). I highly recommend him- he's a great guy.

Plenty of PC games run just fine on the cabinet. Pretty much whatever games you can remap the keys for will work. Tiger Woods plays **fantastic** on the cabinet, by the way.

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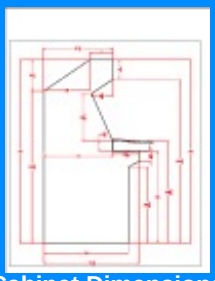

Cabinet Dimensions

Cabinet Plans 2: Final Thoughts

Final Thoughts

I suppose this is the page where I impart some great pearl of wisdom that will get you past any problem you encounter during construction. I have no such nugget. What I will say is that almost any problem you encounter during construction can be fixed, and usually quite easily. You might have to step back, take a break and consider all the possibilities. Myself, I like to rant a little while, take about an hour break, and during that time away from the project, the solution has presented itself.

Remember this, too, that any imperfection in your cabinet will only be seen by you. I can guarantee that anyone that comes over to admire your work and to play on the cabinet will never notice these slight blemishes. My cabinet has so many issues from it being my first attempt it is not even funny, but no one else ever notices them.

I hope these plans have helped you in some way. If you have any questions before or during construction, feel free to fire off an email to me. And once your project is complete, please send me some pictures I can post.

Good luck.

Mike

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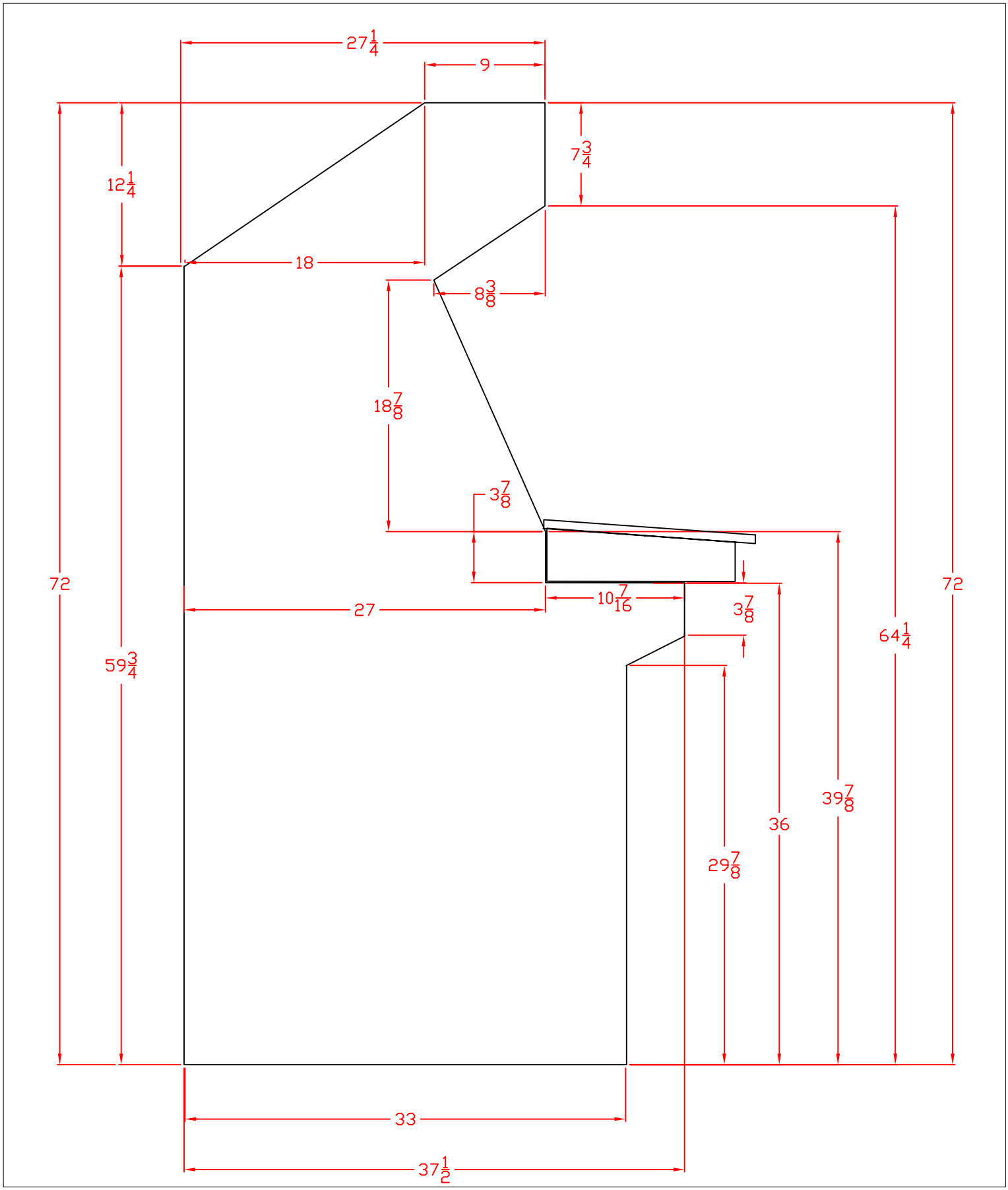
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MAME
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BLUE MEANIE