
INTRODUCTION

Thanks for downloading these plans. We are excited that you decided to build your own speakers. By building your own speakers you can be SURE that what you build is of the highest quality. You can surely buy speakers that are cheaper, but like anything else, you get what you pay for. When you build your own, you can control the quality of materials and craftsmanship that go in to your project. Undoubtedly, if you choose good materials, your correctly built speakers will give you many more years of reliable service than “no name”, foreign, price-point driven speakers made of cheap press-board and substandard drivers. You surely know this since you have chosen some of the most reliable drivers on the market from which to construct your speakers.

SAFETY

Obligatory Disclaimer: Please understand that woodworking and DIY in general are inherently dangerous. Please read and understand all the instructions and precautions that come with the tools you intend to use to complete this project. Eminence Solutions accepts no responsibility for injuries or damages you might incur from following these plans. Eminence Solutions has made no attempts to prove the safety or correctness of the steps outlined in the project. Proceed with this project **AT YOUR OWN RISK!**

QUALITY

The quality of the build depends on several factors beyond the control of this instruction set. The accuracy with which you build the speaker, your woodworking ability, and your attention to detail will all affect the outcome. Eminence Solutions assumes no liability or fitness for use if you decide to use these plans to build speakers. We have found that builders are most successful with this project if they read and study the entire procedure before beginning construction of their speakers.

DESIGN SPECIFICATIONS

The speaker that you produce from this project is designed to meet the following design goals.

1. Frequency Response:
 - a. Good response to 50 Hz (3db down @ 52Hz).
 - b. Usable extension to below 50 Hz (10db down @40 Hz).
 - c. Good bass “impact”/”punch”.
2. Power Handling:
 - a. Mechanical power handling is equal to electrical power handling down to 80 Hz (400 watts).
 - b. Power handling when used full range is limited by mechanical power handling (200 watts).
3. Maximum output (SPL):
 - a. 124db from 80Hz to 20kHz +- 3db @ 400 watts.
 - b. 121db from 40Hz to 20kHz +3db -10db @ 200 watts.
4. Six reasons to use column array speakers (like this design).
 - a. Column arrays like this tend to be less obtrusive since the top box is very narrow. This makes them good for small stages or lecture venues, such as churches or business meeting rooms.

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- b. Column arrays “throw” farther. This means the volume at the back of the venue can be louder without blasting out the people in the front of the venue.
 - c. Column arrays can provide better coverage side to side with smoother frequency response at the sides. Using large woofers, such as 15” drivers, to do midrange duty creates a problem called “BEAMING”. People sitting in front of the speaker hear good midrange and those sitting off to the side will not be able to hear the midrange. Smaller drivers greatly reduce this effect. The 3” drivers used in the project effectively eliminate beaming in all but the very highest frequencies.
 - d. The band pass woofer will be higher in output and deeper in bass than comparably sized and priced “point source” speakers.
 - e. Column arrays (in two parts) are generally lighter and easier to move and set up.
 - f. Column arrays are best suited for smaller stages, and longer, narrow rooms.
5. The following graphs show the predicted output from Eminence Designer software.

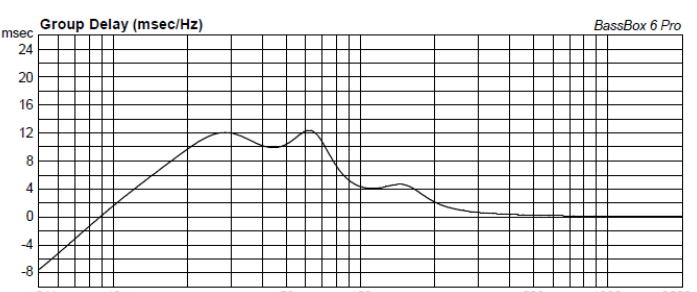
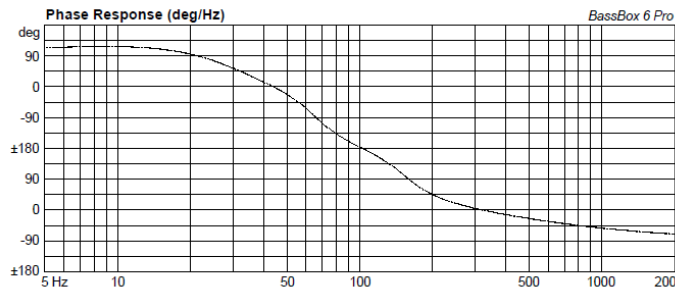
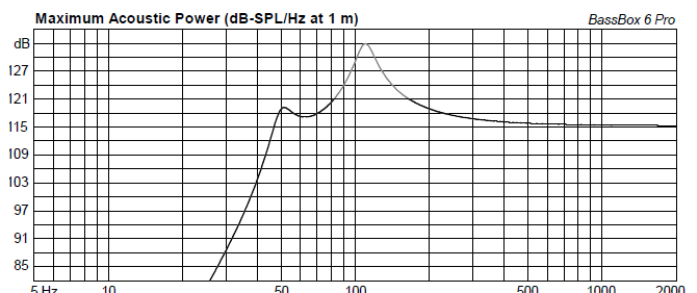
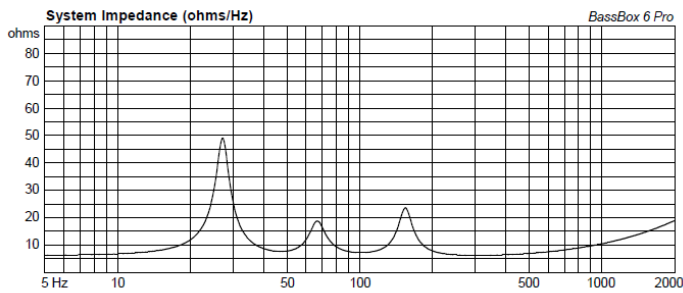
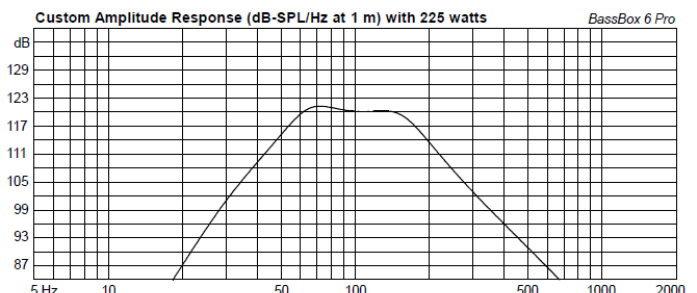
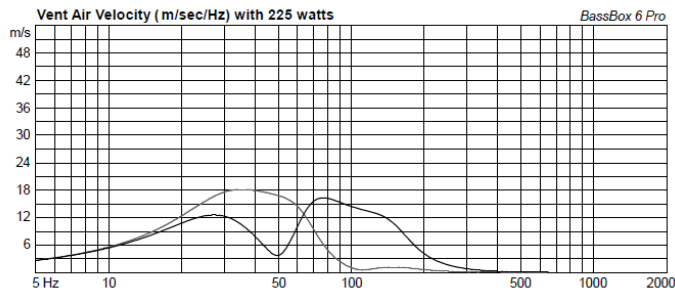
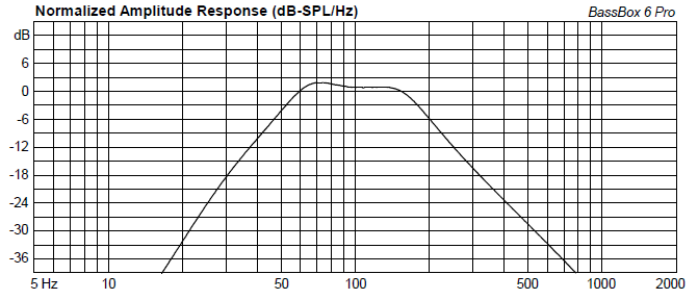
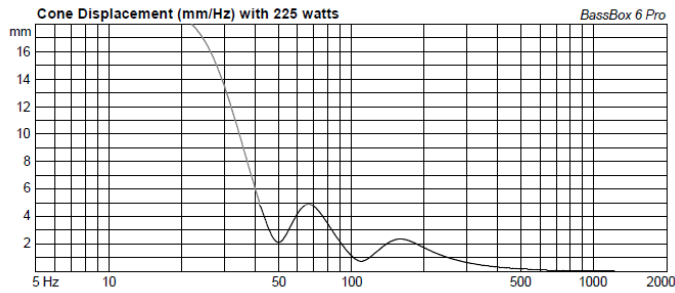
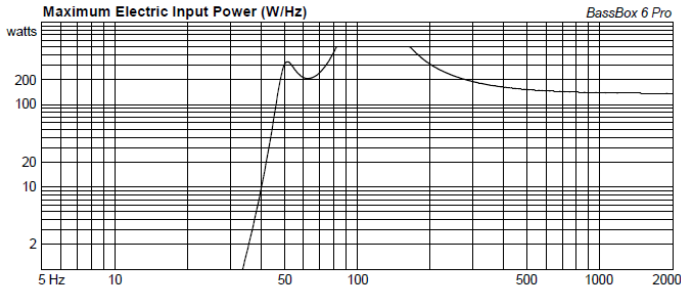
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Band Pass Cabinet Predicted Responses



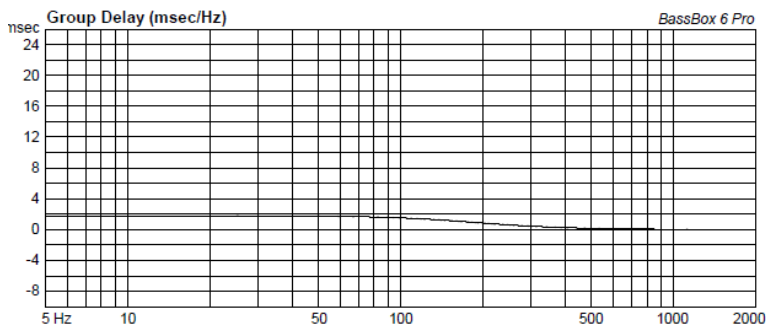
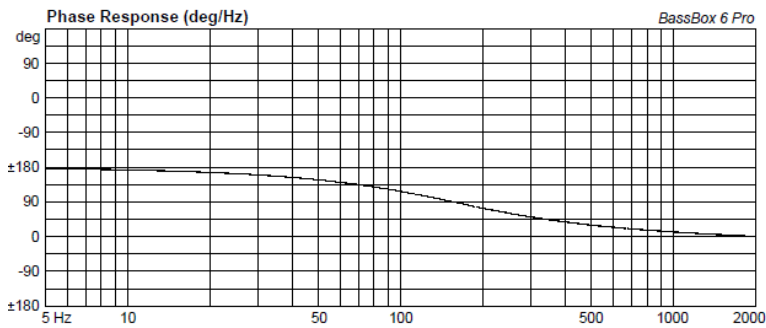
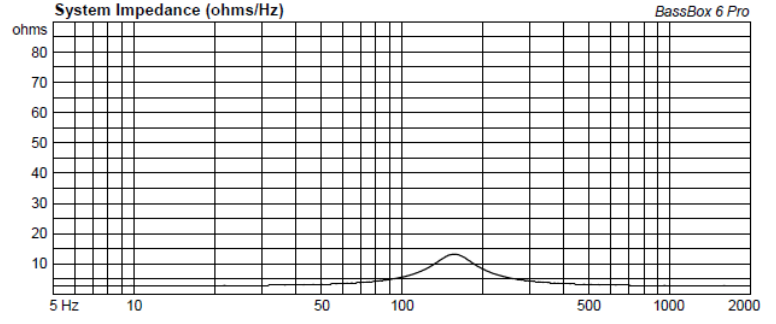
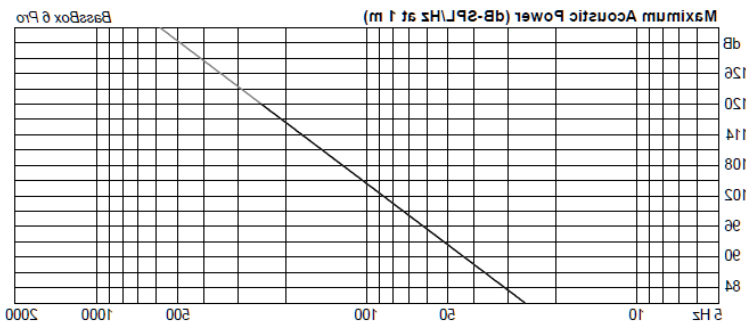
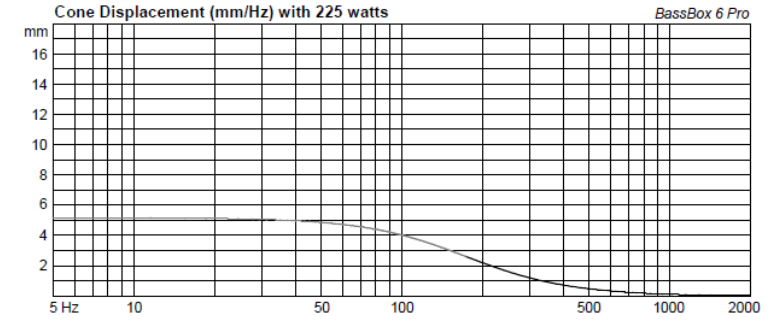
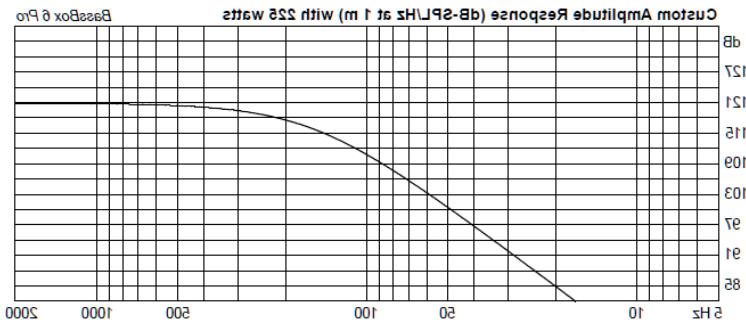
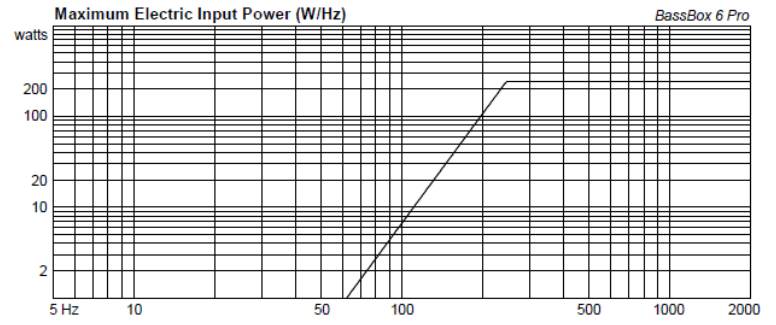
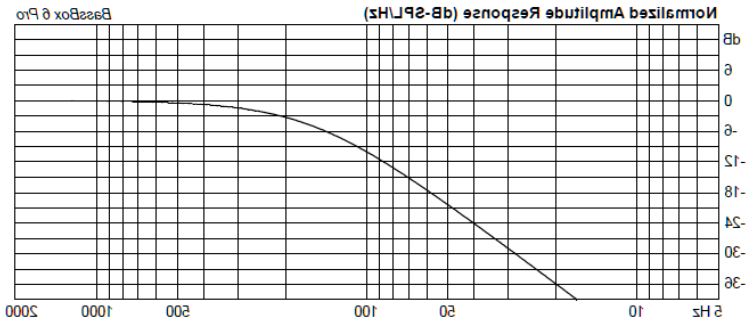
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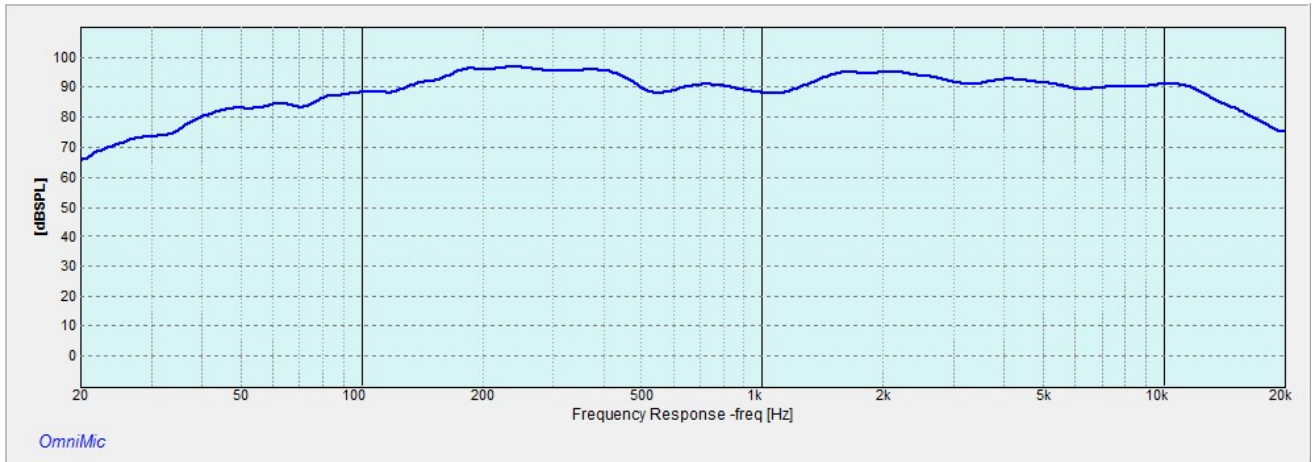
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Column Predicted Responses

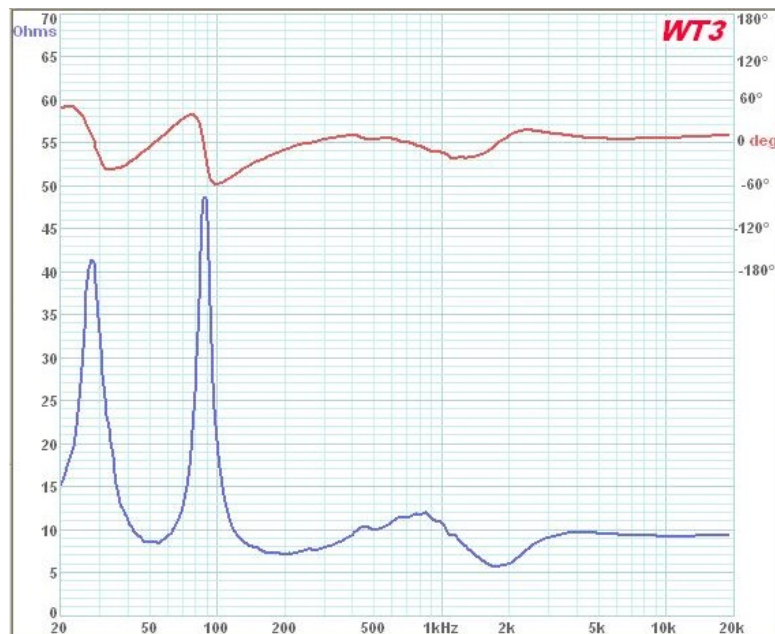


6. Measured Output (Complete System):

a. Frequency Response @ 2.83V @ 1m



b. Impedance Response



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ELECTRICAL COMPONENTS (for one speaker)

1. (1) Eminence Delta 12LFA woofer
2. (8) Eminence Alpha 3-32
3. (1) Input Cup (Parts Express # 262-334)
4. (2) Speakon Connectors (NL4MP) (PARTS EXPRESS # 092-052)
5. (1) Speakon Connector (NL4MPR) (PARTS EXPRESS # 092-054)
6. 16 ga hook up wire (red, and black, white)
7. Assorted crimp connectors
8. Crossover Parts:
 - a. C1= 100 uF non-polarized electrolytic capacitor such as (Parts Express # 027-360)
 - b. C2= 10 uF polypropylene capacitor such as (Parts Express # 027-428)
 - c. L1= 0.6 mH air core inductor (at least 16 ga) such as (Parts Express # 257-312)
 - d. C3 = 24 uF polypropylene Capacitor such as (Parts Express # 027-586)
 - e. R1 = (2) 4 ohm power resistor (20 watts is best) such as (Parts Express # 017-4)

MATERIALS/TOOLS

Minimum Required materials:

- ☐ One sheet of ¾" plywood. The best grade you can afford. Birch plywood is best. Buy either one 4'x8' sheet or two 5' by 5' sheets. Most big box stores will cut the sheets in half for you to make handling easier. If you want to pay extra, most will make multiple cuts.
- ☐ Drywall screws. A small box of 1 1/2" #6 bugle head screws.
- ☐ Drywall screws. A small box of 1" #6 bugle head screws.
- ☐ Bugle head washers
- ☐ Nails. 1 ½" #6 or #4 finish nails or 16-gauge air-nailer.
- ☐ Nails. 1" #6 or #4 finish nails or 16-gauge air-nailer and nails.
- ☐ Glue. Any wood glue is fine.
- ☐ (8) #8 x 1 ½" pan head bolts and t-nuts
- ☐ (2) Handles (PARTS EXPRESS # 260-701)
- ☐ (1) Spring Loaded Flush Mount Handle (PARTS EXPRESS # 262-305)
- ☐ Grills (PARTS EXPRESS # 262-878) or aluminum gutter guard
- ☐ Paint or carpet – Your choice. For a professional look contact a local truck bed spray liner company. Some companies will coat a box for as little as \$50.00.

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- ☐ (2) Pole Mounts (PARTS EXPRESS # 245-012)
- ☐ ½ set of Interlocking Cabinet Corners (PARTS EXPRESS # 262-834)
- ☐ ½ set of Metal Cabinet Corners (PARTS EXPRESS # 262-836)
- ☐ Max compression polyurethane foam tape – For sealing around cutouts. Such as Frost King L34IBH
- ☐ One bag of polyester low loft quilt batting
- ☐ One bag of polyfil pillow batting
- ☐ Zip ties
- ☐ Wood Filler

REQUIRED TOOLS:

1. Stapler and 3/8" staples
2. Combination square
3. Jig saw
4. Drill
5. Drill bit assortment
6. Countersink bit
7. Hole saw 1 1/2" (for making pole mount cutouts), 3" (for cutting the alpha 3 mounting holes)
8. Palm sander or sanding block
9. Assorted sandpaper
10. Pop rivet tool and assorted pop rivets
11. Dremel tool and cut off wheels
12. Router
13. 3/8" curved bit (cabinet corners), bottom following flush trim bit (for flushing cabinet sides), top following flush trim bit (for making access panel cut out)
14. Compass
15. Nail Punch
16. Hammer
17. Connector Crimping Tool
18. Spatula for applying wood filler

OPTIONAL TOOLS:

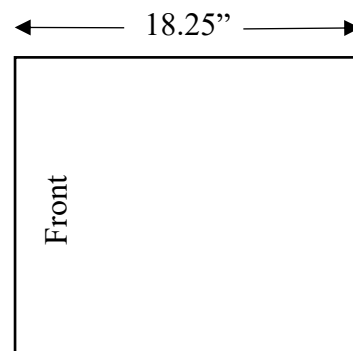
1. Table saw (really not optional for a good fitting box)
2. Belt sander
3. Router circle jig and ¼" straight bit
4. Kreg pocket hole jig and coarse screws

PARTS LIST/ DRAWINGS/SPECIFICATIONS

Go to the end of this document for a complete list of cabinet parts.

PROCEDURE (Band Pass Box)

1. First cuts.
 - a. Cut two panels 17.5" x 4'. These will end up forming the left and right sides, baffle board and front of the cabinet. For proper fit, do not move the table saw fence until all these panels are cut to width.
 - b. From one of the above boards, cut two panels that are 18.25" x 17.5". These will be the right and left sides.
 - c. Label the sides as left and right and label one edge of each panel as the front.
 - d. Cut the handle cut-outs.
 - i. Mark a vertical line 9 ½" from the front edge of the 18.25" dimension.
 - ii. Mark a horizontal line 4" down from the top of the box (17.5" dimension).
 - iii. Mark a second horizontal line 7" down from the top of the box.
 - iv. Make vertical lines 2 9/16" on either side of the vertical line in step 1 above.
 - v. Test fit the handles and adjust the cut-out as necessary.
 - vi. At this point there is a definite left and right-side panel. Assembling the cabinet with these panels in an incorrect orientation will cause the handles not to be even and/or centered.
 - e. From one of the above boards, cut one panel that is 17"x 17.5". This will be the baffle board. This board will be a little oversized in the 17" dimension. It will be trimmed for a perfect fit just before it is installed.
 - f. Cut two panels that are 19" x 18.25". These will be the top and bottom panels. Note that the top and bottom panels will extend to the very edges of the front of the box.
 - g. Cut one panel that is 19" x 19". Cut this panel just a little oversized. It will be trimmed with a flush trim router bit once installed.



TIP: It is good practice to label the dimensions of the sides of each panel once cut. It is also a good idea to write the name of the panel on the both faces of the board. This will keep you from cutting up a board that has already been designated for other uses.

2. Making the Ports

- a. Two ports will be cut from one port assembly. Once constructed, the port assembly should be cut on a table saw so that all edges line up properly.
- b. Cut two pieces of wood 16.25" x 10.25". These will form the top and bottom of the port.
- c. Cut 3 strips of plywood 1.25" x 10.25". These will form the sides and center divider of the port.
- d. The above dimensions are critical to a good speaker.
- e. Mark a centerline on the top and bottom of the port all the way around. This will help in aligning the center divider and provide a nailing guide.
- f. When assembling the ports in the next step, make sure no nails are within the saw kerf of the port. This means that no nails should be at the 2.25" to 3" distance from one side or on the 8.75" to 9.5" distance.
- g. Glue and nail the three strips at the center and at each end of the port sides.

TIP: When gluing up an assembly, the glue provides a slippery surface and the two boards tend to slide around during nailing. Letting the glued panels set for a minute or two will lessen the slipping making precise nailing easier.

- h. Glue and nail the other port face onto the assembly.
- i. Cut the port assembly into two ports.
 - i. Start by trimming the leading edge of the assembly so that the surface that mates with the port baffle board will be perfectly even and square.
 - ii. One port will be 2.5" long and the other port will be 6.5" long.
 - iii. There will be some of the port assembly left over. Do not discard this piece, it will be used as a template in the next step.



3. Making the Port Baffles

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- a. Cut two 17.5" x 5.5" panels using scrap from the cuts made in step 1.
- b. Strike a line along the long side of each board all the way around at 0.75" from the edge. This will mark the outer edge of the port and also indicate the part of the baffle board that will go towards the outside edge of the box.
- c. Mark a line on the center of the long side of the port baffles on both sides of the board.
- d. Mark a line all the way around the port baffles at 4.25" along the long side. This mark will be used for mounting the port baffles to the cabinet front in the next step.
- e. Line up the port cut off piece with the center line of the port aligned to the center line of the port baffle board. Also, align the outside edge of the port template with the 0.75" mark. Trace the inside and outside on both sides of the port baffles. Repeat this step on the other side of the port baffles.
- f. Glue and nail the ports to the port baffles using the outlines for alignment.
- g. Use a drill and a 1/2" drill bit to drill holes in the corners of the port baffles staying at least 1/8" inside the lines.
- h. Cut out the ports in the port baffles using a jig saw. Stay away from the inside edge of the ports at least 1/8".
- i. Use a bottom following bearing flush trim router bit to finish opening up the port. Be sure to move the router around the inside of the port in the proper direction (clockwise). When routing on the outside of a panel the router should move counter clockwise. Make thin cuts and don't force the router into the cut.
- j. Use a 3/8" radius bottom following bearing router bit to round over the port edges on the port baffle board if you would like.



4. Attach the cabinet front to the port baffles.
 - a. Cut a 17.5" x 9" cabinet front from the pieces cut in step 1.
 - b. Glue and nail the cabinet front to the port baffles so that the total width of the assembly is 17.5". Use the 4.25" marking on the port baffles to assist in alignment.
 - c. Be sure to measure the width at the top and bottom. Use clamps to attach the port baffles for test fitting.
 - d. Make sure that the port baffles are spaced evenly on the cabinet front.
 - e. Nail through the cabinet front and into the port baffles. The cabinet front should be PROUD of the port baffles (see picture at right).



5. Finish and mount the driver baffle board.
 - a. Mark lines from corner to corner of the driver baffle board to locate the center of the driver baffle board. These marks should make an "X" from corner to corner, diagonally, on the baffle board.
 - b. Cut an 11" diameter cut out in the baffle board.
 - i. This can be done using a router with a circle cutting jig (preferred) or a jig saw.
 - ii. If using a jig saw to cut the driver mounting hole, set a compass to 5.5" and position the pivot on the center of the "X" and sweep the compass to create a line that marks the cutout.
 - iii. Use a drill and 1/2" drill bit to create a starting hole near the edge of the cutting line. Cut half of the line away for a proper fit. When using a jig saw it might be necessary to use a sanding drum and drill to clean up the hole and create a good fit for the driver. Cutting the driver mount too big will weaken the hold of the mounting bolts.
 - c. Insert the woofer into the mounting hole and mark the locations of the mounting hardware using a pencil to mark through the mounting holes in the driver.



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- d. Remove the woofer and drill the mounting holes in the baffle board. Use a drill bit that is just slightly larger than the barrel of the t-nuts that you have selected.
- e. Turn the baffle board over and hammer blind nuts into the hole. Be careful to align the blind nuts as shown to the right to ensure that all the prongs on the blind nuts grip the wood.
- f. The baffle board might be a little long at this point (front to back). The height of 17.5" should be exactly right.



- g. Use some clamps to temporarily affix the front to the bottom and check the fit of the driver baffle board. You might need to trim this board on the table saw.
- h. Once you are sure that the driver baffle board is a snug fit all the way around, you may proceed to mount the driver baffle board to the cabinet front.



- i. Strike a line vertically on the inside of the cabinet front 4.5" from the short port side. This is a critical dimension, be exact as possible.
- j. The baffle board is installed with the t-nuts on the short port side of the driver baffle board.
- k. We have found that the easiest way to install the driver baffle board is by using the Kreg pocket hole system. This is not required. You may use long nails through the cabinet front if you wish.
- l. If you are using the Kreg system, be sure to support the short port side of the driver baffle board with a block of wood, 17.5" long and trimmed to exactly fit between the port side and the baffle board. When we did this the board was 1" wide. Your board might be wider or narrower depending on the precise placement of the port on the port baffle board or the exact location of the cabinet front onto the port baffle board. This spacer is needed since the Kreg system tends to pull the driver baffle board towards the port when screws are installed.

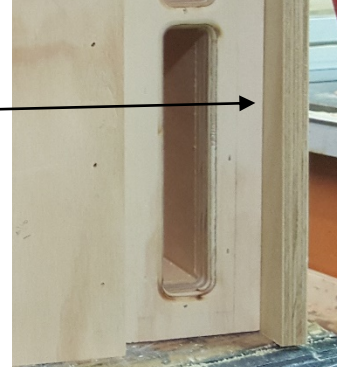


- m. The response of the whole band pass cabinet is dependent on all dimensions being exactly, but it is especially important that the smaller chamber be an exact volume. It is critical for the band pass cabinet to perform properly that the driver baffle board be 4.5" from the cabinet side and be as square and plumb as possible.

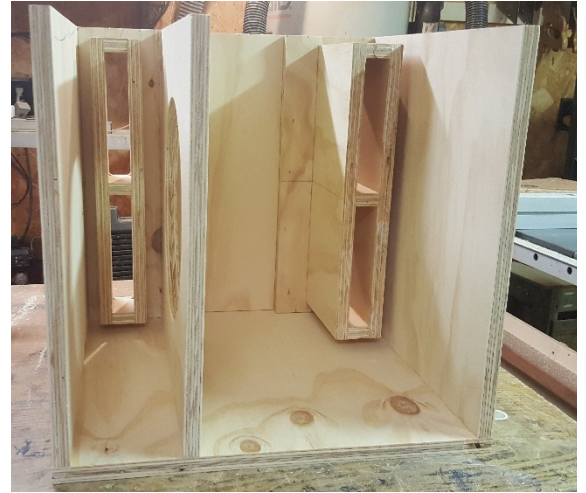
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6. Nail the cabinet sides onto the cabinet front.
 - a. Use a scrap of plywood (thickness) to help align the port baffles. The stand-off from the front of the box to the port baffles is 0.75".
 - b. Nail the sides into place making sure they are square and plumb to the cabinet front.



7. Nail the top and bottom onto the cabinet front and sides.
 - a. Mark a line all the way top and bottom panels at 5.25" and 6" from the short port side of the top and bottom. This will serve as nailing and driver baffle alignment guides.
 - b. Align the bottom with the cabinet front and sides and glue and nail in place. Use plenty of glue and do not forget to apply glue to the driver baffle board and nail it in place as well. Be sure to align the driver baffle board properly.
 - c. Glue and nail to top in place.
 - d. Glue and nail the cabinet back in place. (Don't forget the driver baffle board.)
 - e. Use a bottom following flush trim bit to trim all edges of the box flush.



8. Cut out the access hatch.
 - a. Mark the Edges of the Access Hatch.
 - i. Strike a vertical line 7" from the short port side of the box.
 - ii. Strike a vertical line 3.5" from the long port side of the box
 - iii. Strike horizontal lines 2.75" from the top and bottom of the box.
 - iv. These lines establish the edges of the driver access hatch.

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- b. Use a jig saw and drill to cut a rough opening. Stay away from these lines 1/8". The hatch will be "cleaned up" in the next step.
- c. Cut trimming guides (approximately 2" wide) to use when cleaning up the access hatch. Using small nails attach the guides to the back, DO NOT GLUE. Cut these strips as necessary to make a good template. Align the guides as close to the guide lines as possible.
- d. Using a top following flush trim router bit, finish the access hatch cut-out.
- e. Remove the trimming guides.

9. Finish the access hatch.

- a. Cut 4 strips of wood 1.5" wide. You will need 2 pieces approximately 16" long and 2 pieces approximately 8.5" long.
- b. Mark the centers of these strips (parallel to the long side).
- c. Glue and nail two vertical 16" piece to the insides of the hatch leaving 3/4" protruding.
- d. Custom cut and nail the two horizontal 8.5" pieces to the inside of the hatch leaving 3/4" protruding. You should now have a "shelf" all the way around the inside the access hatch. This "shelf" will be use to attach the access hatch panel.

10. Cut the access hatch panel

- a. For the access hatch panel in the prototype speaker, the dimensions of the hatch were 8.5" x 13.5". Your hatch may be slightly different in size. Cut an access hatch panel from the remaining wood. The panel should be about 1/8" narrower and shorter than the cut out (NOT THE SHELF DIMENSIONS). The corners of the access hatch are rounded because of the router bit. Use a sander and round the corners of the access hatch panel so that the panel will fit in the cut out.
- b. Strike lines 3/4" in from each side of the access panel. Used these lines to guide your screw placement to install the access panel. Come in 1 1/2" from each side and drill a screw hole just slightly larger than the screw you will use to attach the panel. We used 1 1/2" #6 drywall screws. Countersink the holes. Place more screw holes evenly around the cut out about 4" apart.

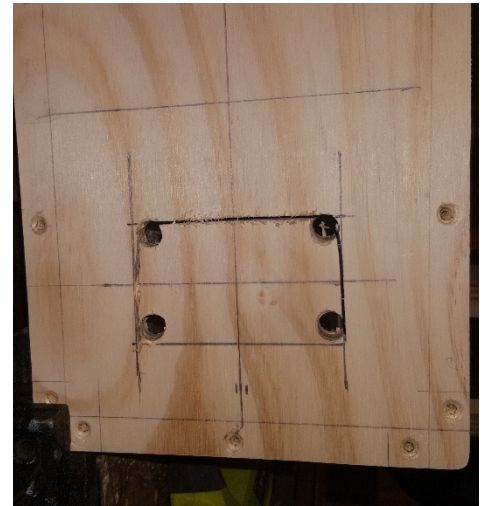


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11. Create a cut out for the input cup.

- Mark the center of the access panel both vertically and horizontally.
- Make another mark that breaks the bottom half of the panel into quarters.
- Strike two vertical lines that are 2" from each side of the vertical center line.
- Strike two horizontal lines that are 1 3/16" above and below the "quarter line".
- These lines mark the cut out for the input cut.
- Cut out the cut-out using a jig saw. Cut the line away for a good fit. Test the fit and sand as necessary



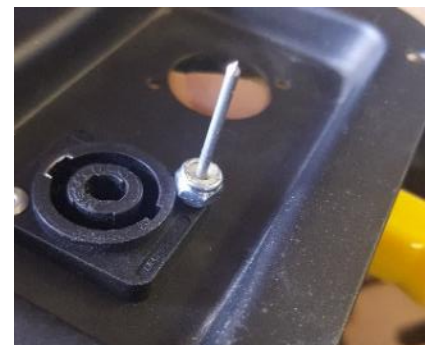
12. Prepare the input cup.

In our opinion, mounting the Speakon connectors with pop rivets makes an air tight seal that will not vibrate loose when the speaker is in use. If you wish, you may use small screws or bolts and nuts. If you have little experience with pop rivets, YouTube is a great source for tutorials on the use of pop rivets.

- Mount the Speak-on connectors in the input cup. The easiest way to accomplish this is with pop rivets. Choose a pop rivet for this that most snugly fits the set up. Be sure that the metal tabs in the Speak-on connectors are oriented in the same direction on the input cup.



TIP: Sometimes the rivet gun can deform the edge of the connector. Using a small nut as a standoff can fix this problem.

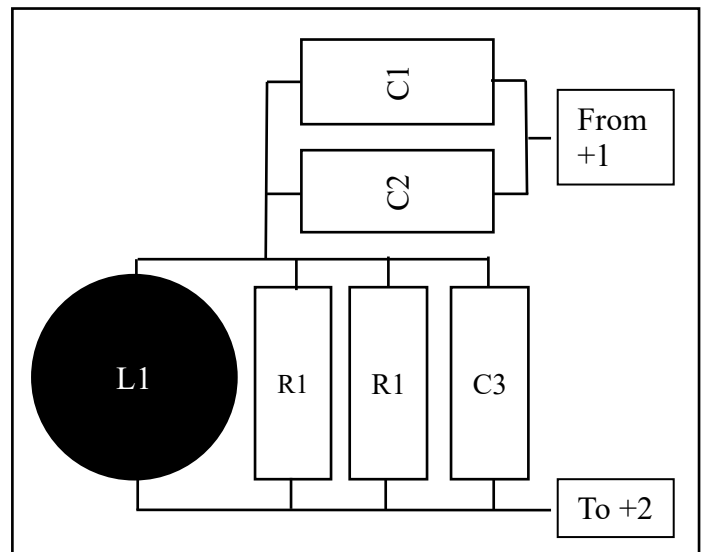


- b. Looking at the input cup from the rear, with the front metal tabs facing up, the spade lugs run in a clockwise direction 1+, 1-, 2+, 2-.

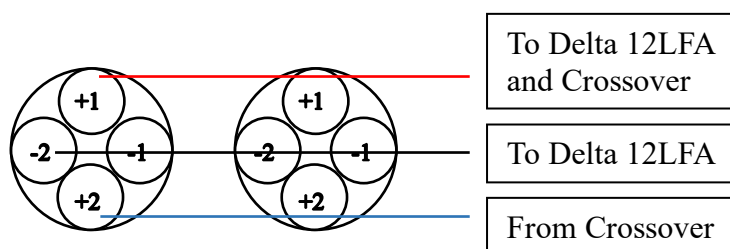


13. Crossover

- a. The band pass box has no electrical crossover, but the crossover for the column will be housed in the band pass box.
- b. The crossover consists of a 6db per octave high pass filter and a parallel notch filter to smooth out the 1khz spike in the column response.
- c. There are 4 connections on each of the NL4 input connectors 1+ and 1- will bring the signal into the system. 2+ and 2- will send the filtered signal to the column.
- d. Cut a 6" x 6" piece of thin plywood to use as a crossover board.
- e. Mount the parts on the crossover board by applying silicone to the back of the components (to reduce the chance of components buzzing) and zip tie them to the crossover board.



- f. Wire the crossover to the input cup as shown. All “-” leads will be wired together.
- g. All the 1+ leads will be wired together and all the 2+ leads will be wired together.



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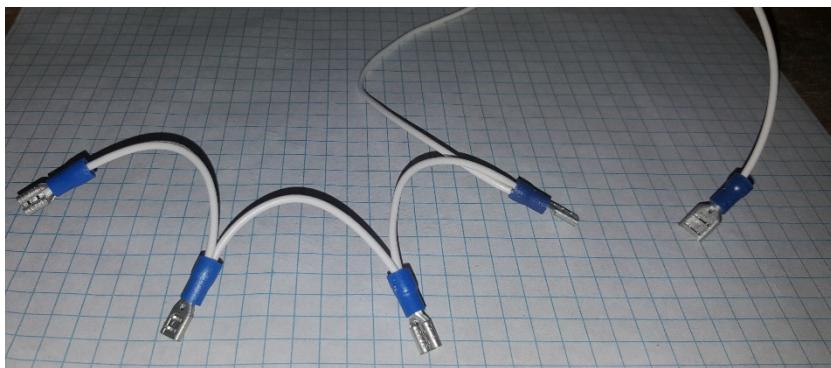
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- h. Mount the crossover board to the inside of the access hatch panel above the input cup.

14. Create wiring harnesses to connect the Input Cup to the cross over and DELTA 12LFA.

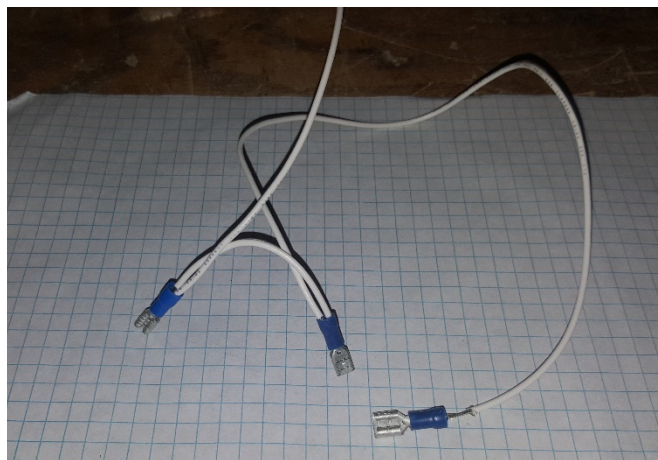
- a. Create the wiring harness from 16 ga or less wiring. Use three different colors of wire to avoid confusion. Red, Black, and White are suggested.

- b. The black wire will be used as the "ground" or "negative" of the system. Cut 3 pieces of black wire approximately 3" long. Cut 1 piece of wire approximately 12" long. Strip both ends of all pieces of wire. Strip approximately 1/4" from the ends. Apply a 3/16" crimp on connector to one end of the first wire. Create a wiring harness that looks like the picture to the right. The last connector on the 12" piece should be a 1/4" connector. Even though the wires shown to the right look white, they are black!

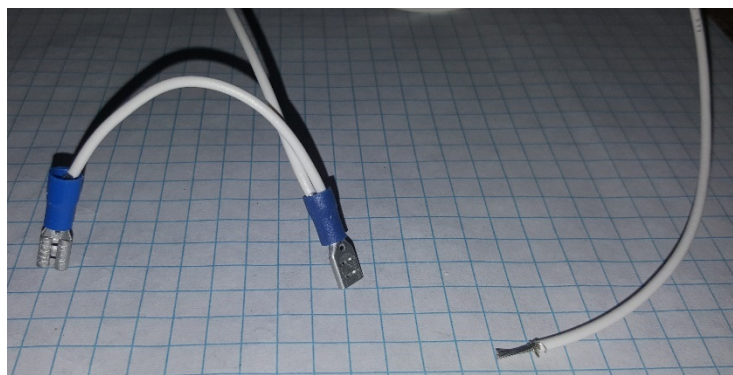


- c. The first four connectors will connect to the "-" lugs of the input cup. The last connector will connect to the Delta 12LFA negative terminal.

- d. Create the positive (+) or red wiring harness. The first lead that goes off the picture will be soldered to the input of the crossover. The first two 3/16" crimp on connectors will connect to the +1 lugs on the input cup. The third 1/4" connector will connect to the + terminal of the Delta 12LFA. Even though the leads look white in this picture, they are actually red!



- e. Create the white wiring harness. The first two connectors will connect to the +2 lugs on the input cup. The bare wire will solder to the output of the crossover. Even though the leads look white in this picture, they are actually white!



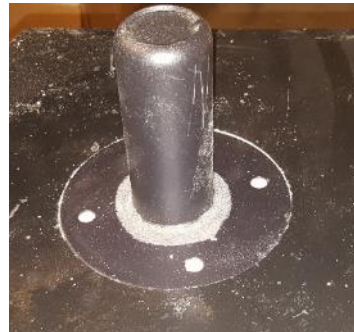
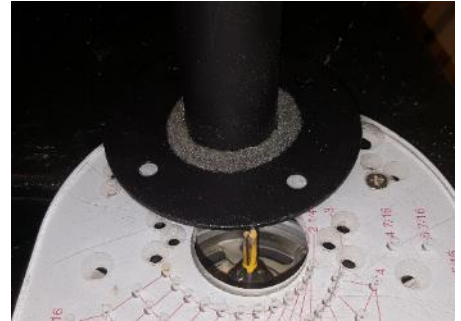
- f. Connect all connectors to their proper lugs and solder the crossover leads in place.

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15. Cut the pole mount hole.

- Mark an "X" on the top of the box by using a straight edge from diagonal corners.
- Use a 1 5/8" drill bit to make a hole at this point. A hole saw is easiest but any properly sized bit will do.
- Insert the pole mount into the hole to ensure that it fits. If it does not fit, wrap a piece of sand paper around a section of dowel or broom handle and sand the hole until the pole mount fits.
- Instructions for flush mounting. If not flush mounting, go to the next section.
 - Set the pole mount in place and mark the perimeter with a pencil.
 - Set a router to the depth of the pole mount (usually 0.125").
 - Route away all the wood that is inside the area you traced from the pole mount.
 - The goal of this step is to have the pole mount flush with the bottom when finished.
 - Verify that the base of the pole mount fits in the cutout.

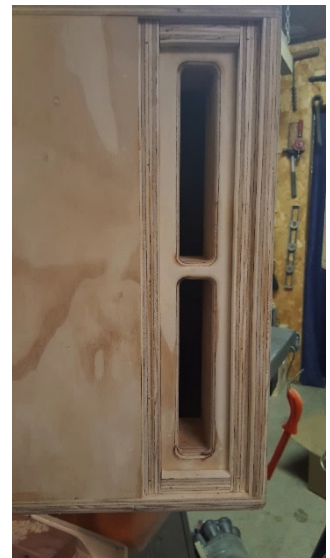


16. Baffle port stand-off strips.

- Stand-off strips need to be created to minimize the chance of the grills buzzing on the port baffles.
- Cut 5 strips of wood that are 3/4" x 3/8" x 17.5" long. Attach one strip with glue and nails to each side of the port baffle. The 3/4" side should be flat against the baffle so that the stand-off height is 3/8". Custom cut and fill in the top and bottom edges of the port baffle board.

17. Finishing the Cabinet.

- Using a nail set, be sure all nails are set just below the surface of the wood.
- Fill all nail holes and defects in the box with wood filler and allow to dry.



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Solutions

- c. Regardless of the finish you use, most defects will “telegraph” through the finish. For a professional looking box, the surface must be smooth and defect free. Pay special attention to the edges of the box.
- d. After the wood filler has dried, sand the box with your choice of sand paper. I prefer 120 grit.
- e. This step is optional, but to make the box hard and scratch resistant create a mix 50/50 wood glue and water.
- f. Paint all surfaces of the box with this mixture. Go sparingly. Allow the glue mixture to dry. Repeat this process until no more mixture absorbs into the wood.
- g. Apply the final finish to the cabinet.

18. Cut the grills.

- a. Cut the grill material to 4.25” x 17.5” using a Dremel tool and a cut off wheel or a pair of tin snips.
- b. Use blue painters tape to mark the line you will cut on.
- c. We used a pair of tin snips on the first grill but found that it is much easier to cut these with a Dremel tool.



- d. Paint the cut grill edges. Sometimes the edges will not show when the grill is mounted and will not need painting.
- e. You may need to trim the grills a little smaller to fit properly depending on precise layout of your port baffles.
- f. In this speaker design it is possible to use aluminum gutter guard instead of store bought grill material. This will save a considerable amount of money. If using gutter guard, wipe the grill with acetone and paint them after cutting them to size. This can also be done for the column speakers.

19. Mount the grill material

- a. Paint the drywall screws you will use black. Use 1” drywall screws and black bugle head washers to install the grill. Place one fastener in each corner of the grill. Then space more screws evenly about 3 to 4 inches apart around the edges of the grill.
- b. If you find that the grills buzz in use, apply black felt to the stand-off strips with a spray adhesive.

20. Pad the inside of the woofer chamber on all sides possible with blanket batting. Fold the blanket batting in such a way that it is at least ½” thick. Cut the blanket batting to fit and staple in place with 3/8” staples, if you wish you may use a spray adhesive to help bond the batting to the inside panels of the box. Do not place batting in the short port chamber. It should be bare.

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21. Finishing the Band Pass Cabinet.

- a. Place gasket material (high compression foam) around the input cup, pole mount, and access hatch to provide good seals. This will make the Band Pass cabinet perform optimally.
- b. Install the speaker pole mount. This can be done with either #10, 1" flat head screws or bolts and nuts. If using bolts and nuts, use a nylon insert nut to keep the nut from rattling loose during use. You may also wish to use an appropriately sized fender washer on the inside to provide more support. This is only necessary if you intend to use a satellite larger than the column speaker in this plan.
- c. Install the Delta 12 LFA using bolts specified above. It is best to thread all the bolts into the t-nuts before beginning the tightening process. Once all bolts have been threaded, snug each bolt. Then go back and torque the bolts down. These do not have to be super-tight, be careful not to deform the frame of the driver.
- d. Install the input cup and handles. We use #6 1" drywall screws and bugle headed washers, feel free to use other fasteners if you wish.
- e. Install the interlocking cabinet corners with #6-1" drywall screws. These are not strictly necessary but do protect the cabinet corners and give the box a nice, finished look.

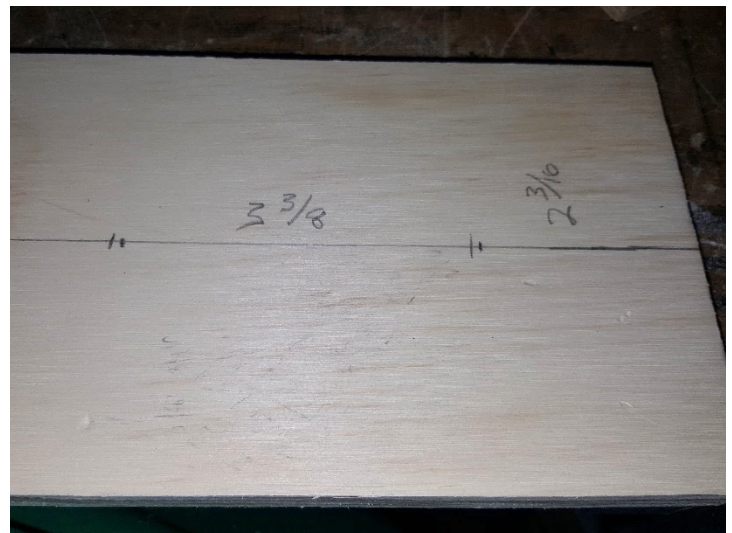


PROCEDURE (COLUMN)

22. Cut 1 board 28" x 4'. You will cut the back, sides and baffle board from this sheet.

23. Cut the baffle board from the above panel. The dimensions of the baffle board are 28" x 4.5".

- a. Mark the location of the drivers.
 - i. Mark a center line down the length of the baffle board.
 - ii. Mark the positions of the drivers on the center line. Come up from the short side $2 \frac{3}{16}$ " and mark the position of the first driver. The progress up the board making a mark every $3 \frac{3}{8}$ ".
 - iii. Repeat the process from the other short side. All the marks should line up perfectly. If the marks are VERY close then make a mark half way between them and use that mark as the center of the driver. If the marks are not VERY close together, re-mark the baffle board. The tolerances on the column speaker are very close with only $\frac{1}{8}$ " between drivers and $\frac{1}{16}$ " from the top and bottom! The left and right dimension are just as critical.



24. Use a 3" hole saw to cut out the driver mounting holes being very careful in the placement of the pilot bit. Sand any ragged edges on the driver mounting hole.



25. Cut the sides from the above 28" x 4' panel. The sides should be 5.25" x 28".
26. Cut the back from the above 28" x 4' panel. The back dimension should be 6" x 28".
27. Create a mounting hole in the back for the input connector. A different type of input connector is used in the column since the crossover for the column is housed in the bandpass box. This will keep anyone from inadvertently attempting to power the system from the column instead of the bandpass box.
- Measure up 7" from the bottom of the back and strike a horizontal line.
 - Mark a vertical centerline on the back panel.
 - Create a mounting hole for the NL4MPR using a 1" spade bit. Drill approximately half way through the back (until the point of the spade bit comes through the other side). Flip the back panel over and finish the hole. This will reduce chip-out.
 - Insert the connector and mark the mounting holes of the connector with a pencil and pre-drill the mounting holes. Do not mount the input connector at this time.
 - You may wish to add a handle to the back of the column. Flush mount handles ARE NOT RECOMMENDED. Instead, a surface mount spring loaded handle should be used.



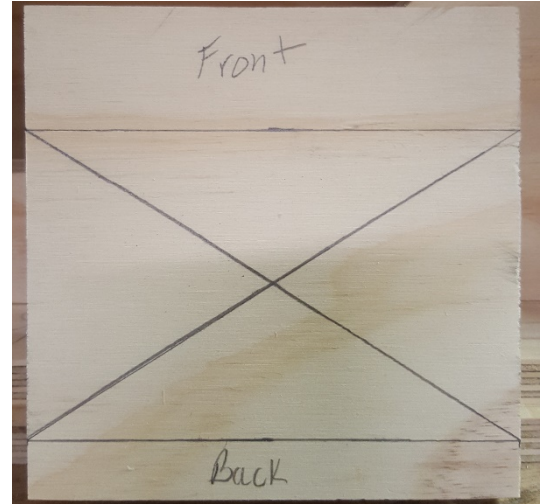
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Solutions

- f. Make a horizontal line across the center of the back. Use the vertical line drawn in step b along with the horizontal line to align the handle. Use a pencil to mark the mounting hole locations and pre-drill the mounting holes.

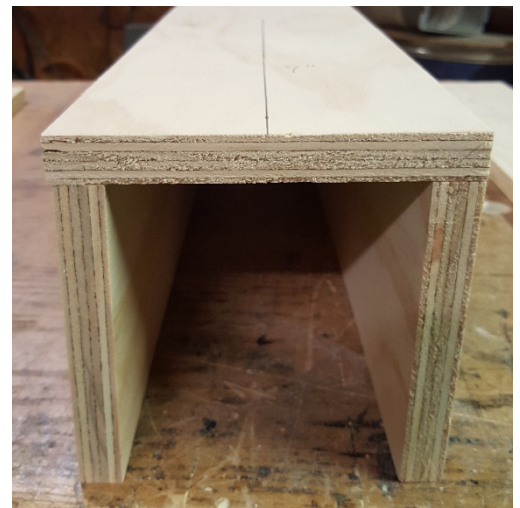
28. Cut the top and bottom panels from any leftover wood. These panels should be 6" x 6".

- a. Create a pole mount cut-out in the bottom panel. Mark the center line from front to back of the bottom panel.
- b. Mark a line 1.5" from the front of the bottom panel. Mark a line $\frac{3}{4}$ " from the back of the bottom panel. Mark the center of the area defined by these lines and the sides of the end panel by marking an "X" on the end panel as shown to the right. This will locate the center of the pole mount cutout. This is a critical dimension. There MUST be enough clearance for the pole mount to clear the driver. If the pole mount manages to interfere with the driver upon assembly some sanding may be required to allow the pole mount to fit. Once you are SURE that the pole mount clears the back of the bottom driver can the pole mount be "flushed". It is recommended that the pole mount be flush mounted if you are going to install the recommended cabinet corners. See the section about flush mounting the pole mount in the band pass enclosure procedures for the steps in doing this.
- c. Use a 1 5/8" hole saw and bore a hole centered exactly on the marks make above.



29. Assemble the cabinet.

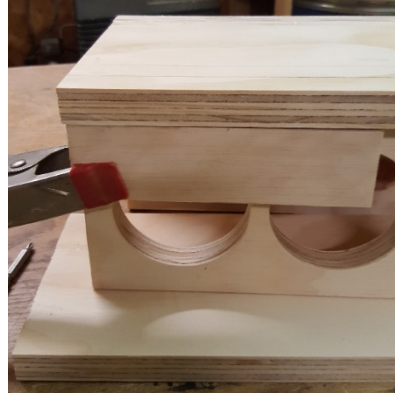
- a. Strike a line on both sides of the side panels that is $\frac{3}{4}$ " in from the front.
- b. Strike another line on both sides of the side panels at 1.5" from the front. This will create a nailing guide for the baffle board.
- c. Glue and nail the back to ONE of the side panels. The back panel should overlap the side panel. Nail through the back panel and into the side panel.



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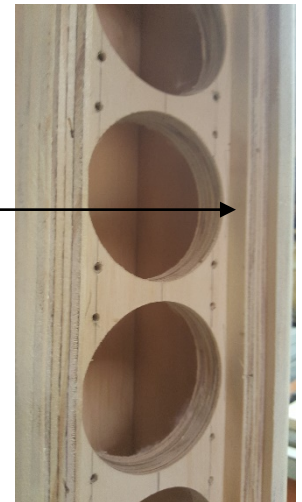
Solutions

- d. Glue and nail the baffle board to the assembly made above. Align the baffle board $\frac{3}{4}$ " from the front of the cabinet. A scrap of $\frac{3}{4}$ " plywood comes in handy for setting this distance.
- e. Glue and nail the second side in place.
- f. Make sure the assembly is square. If it is not the end panels can be used to pull these in place. Glue and nail the end panels in place.
- g. Use a flush trim router bit to trim all edges flush. Use a $\frac{3}{8}$ " round over router bit to round over all edges of the box.



30. Grill stand-offs

- a. The grill stand-off should be $\frac{1}{2}$ " x $\frac{3}{8}$ " x 28". Place a few drivers in the cut outs and test fit the stand-offs. If the stand-offs interfere with the drivers, trim the width of the stand offs. The stand offs should be mounted so that the $\frac{1}{2}$ " side is against the baffle board. This will create a $\frac{3}{8}$ " space between the baffle board and the grill.
- b. You may wish to put grill stand-offs at the top and bottom. We did not since the grill is only 4.5" wide.
- c. Once the stand-offs are in place, set all the speakers in place and mark the mounting holes with a pencil.
- d. Remove the drivers and pre-drill the mounting holes with an appropriately sized drill bit. #6 1" drywall screws can be used to install the speakers, but a better option is #4 1" pan head screws. Do not install the drivers now.



31. Finishing the Cabinet.

- a. Using a nail set, be sure all nails are set just below the surface of the wood.
- b. Fill all nail holes and defects in the box with wood filler and allow to dry.

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- c. Regardless of the finish you use, most defects will “telegraph” through the finish. For a professional looking box, the surface must be smooth and defect free. Pay special attention to the edges of the box.
- d. After the wood filler has dried, sand the box with your choice of sand paper. I prefer 120 grit.
- e. This step is optional, but to make the box hard and scratch resistant create a mix 50/50 wood glue and water.
- f. Paint all surfaces of the box with this mixture. Go sparingly. Allow the glue mixture to dry. Repeat this process until no more mixture absorbs into the wood.
- g. Apply the final finish to the cabinet.

32. Create a wiring harness for the column.

- a. Create a red wiring harness to connect all the drivers’ positive terminals to the input connector. This will be constructed just as in step 14 b. The red wiring harness will have 8 – 0.20” connectors daisy chained with 8” lengths of wire. The last piece of wire in the line will be 12” long just as in step 14b and be terminated with a 0.20” crimp connector.
- b. Create a black wiring harness to connect all the drivers’ negative terminals to the input cup. This will be constructed just as in step 14 b. The black wiring harness will have 8 – 0.110” connectors daisy chained with 8” lengths of wire. The last piece of wire in the line will be 12” long just as in step 14b and be terminated with a 0.20” crimp connector.

33. Install the hardware.

- a. Fill the cabinet with Polyfil pillow batting. The batting should fill the chamber but not be tightly packed. The Polyfil should “give” when pushed.
- b. Attach and install the drivers.
 - i. Feed the wiring harnesses through the cabinet allowing the loose ends to hang out the back of the input cup cut-out.
 - ii. Starting at the top of the speaker, attach the connectors to the tabs on the drivers. It may be necessary to use pliers or a flat screw driver to adjust the tightness of the connectors. The connectors should stay firmly in place when attached but not deform the tab on the driver when being pushed into place.
 - iii. Screw the driver to the baffle board. We used 3.5mm cap screws for this. #4 pan head screws are also fine. Attach the remaining drivers in this fashion.
- c. Attach the pole mount.
 - i. Apply gasket material to the pole mount and install with #10 1” screws.
- d. Attach the input connector.

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- i. Attach the wiring harness leads to the input connector; red wire to the 2+ terminal and the black wire to the 2- terminal.
- ii. Apply gasket material to the input cup and install it with 1" - #6 drywall screws.
- e. Attach the handle.
 - i. Screw the back handle in place using screws of your choice. We used 1" - #6 drywall screws and bugle head washers.

34. Cut the grills.

- a. Cut the grill material to 4.5" x 28" using a Dremel tool and a cut off wheel or a pair of tin snips.
- b. Use blue painters tape to mark the line you will cut on.
- c. We used a pair of tin snips on the first grill but found that it is much easier to cut these with a Dremel tool.
- d. Paint the cut grill edges. Sometimes the edges will not show when the grill is mounted and will not need painting.



35. Mount the grill material

- a. Paint the drywall screws you will use black. Use 1" drywall screws and black bugle head washers to install the grill. Place one fastener in each corner of the grill. Then space more screws evenly about 3 to 4 inches apart around the edges of the grill.

36. If you find that the grills buzz in use, apply black felt to the stand-off strips with a spray adhesive. Cut the grill material. Installing the cabinet corners

- a. We chose to install metal cabinet corners on the columns. These can interfere with the pole mount. The only way to fix this is to install the two bottom rear corners "backwards" or to flush mount the pole mount. If you wish to install these cabinet corners you must make a decision between ease of installation and the "look".

37. Your speaker is now completed! Hook up and enjoy!



DIRECTIONS FOR USE

1. Create a cable to attach the column cabinet to the band pass cabinet.
 - a. You will need two NL4FC cable connectors and a length of speaker wire. The length of the 2-strand wire depends on how you will use the speaker. We used a 6' piece, adjust the length as necessary.
 - b. The 1+ and 1- lugs of the NL4 do not need to be connected. Just connect the +2 and -2 lugs. Verify that

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- the 2+ lug at one end of the wire is connected to the 2+ lug at the other end.
2. Create a pole for the pole mount.
 - a. There are many ways to get a pole for mounting. You can buy a pre-made pole. The band pass cabinet and column speaker are approximately 4' tall. The pole mounts will contain approximately 1' of pole. If you will be using these speakers in a room with standard 8' ceilings then buy/make poles in the length of 3' to 4'.
 - b. If you wish to make your own poles, fencing supply stores sell fence rails that are the proper diameter. Just cut them to length and paint!

For your speakers to perform at their best and last as long as possible, a few tips for use should be observed.

3. If using the speakers as full range speakers, you should roll off the response below 50Hz. The speaker loses control at frequencies below 50 Hz. Boosting these frequencies does little to improve the output and can shorten the life of the woofer. This system was designed with a little bit of bass emphasis, you might consider lowering the bass frequencies. Use an active crossover or equalizer to reduce frequencies below 50 Hz.
4. If operating with a subwoofer, set the crossover frequency to 80Hz with a minimum of 12db/octave slope – 18db/octave is even better.

Handling precautions: Handles for the column speaker were specified to the back of the columns for a reason. When not on speaker stands or pole mounts, the columns can topple over easily. As with any speaker or compression driver, rough handling can cause the driver to separate or horns to crack. Therefore, be sure to place the column on its side or back when not on a stand. There have been reports of magnet structures being dislodged from the baskets during accidents. This is not a defect and is not considered a warrantable incident. Be careful with your columns!

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Solutions

Bandpass System

Ver: 1.0

PARTS LIST/ DRAWINGS

The parts list and layout drawings below are one suggested way to lay out 4'x4' sheets for optimum cutting. If using different sized panels, this layout may not be optimal.

Part #	Sub-Assembly	Description	Copies	# Cut	Thick	Length	Width
3	Bandpass	BP T/B	2	0	3/4"	19"	18 1/4"
4	Bandpass	BP Front	1	0	3/4"	9"	17 1/2"
5	Bandpass	BP Driver Baffle	1	0	3/4"	16 1/8"	17 1/2"
6	Bandpass	BP Port Baffle	2	0	3/4"	5 1/2"	17 1/2"
7	Bandpass	BP Port Sides	1	0	3/4"	10 1/4"	16 1/4"
1	Bandpass	BP Back	1	0	3/4"	19"	19"
8	Bandpass	BP Port T/B	3	0	3/4"	1 1/4"	10 1/4"
9	Bandpass	BP Hatch	1	0	3/4"	13 1/2"	8 1/2"
2	Bandpass	BP Sides	2	0	3/4"	18 1/4"	17 1/2"
10	Column	Column Ends	2	0	3/4"	6"	6"
11	Column	Column Baffle	1	0	3/4"	28"	4 1/2"
12	Column	Column Back	1	0	3/4"	28"	6"
13	Column	Column Sides	2	0	3/4"	28"	5 1/4"

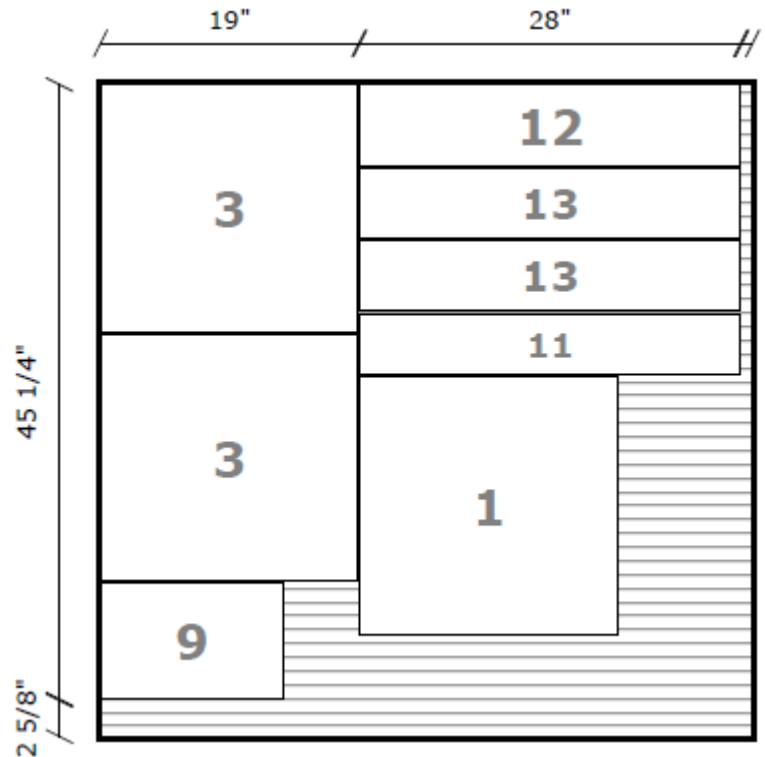
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Solutions

Bandpass System

Ver: 1.0

1. You may wish to start by making a rip cut in the board shown on the right at 19".
2. Then turn the first sheet and make the 18.25" cuts to complete panel #3. This cut will complete the top and bottom of the bandpass box.
3. The second rip cut should be made at 28". Then the boards turned and panels 11 to 13 can be cut.
4. Reset the fence to 19 1/8" and cut panel #1 just oversized. This is necessary to account for any variance in your construction techniques.



5. Start by making the horizontal cut at 17.5". Without moving the fence, make a second 17.5" rip cut. Without moving the fence, turn the first panel and finish panel #2 by making 17.5" cross cuts.
6. These diagrams do not include grill stringers or other very small parts that can be cut from the plywood waste panels.

